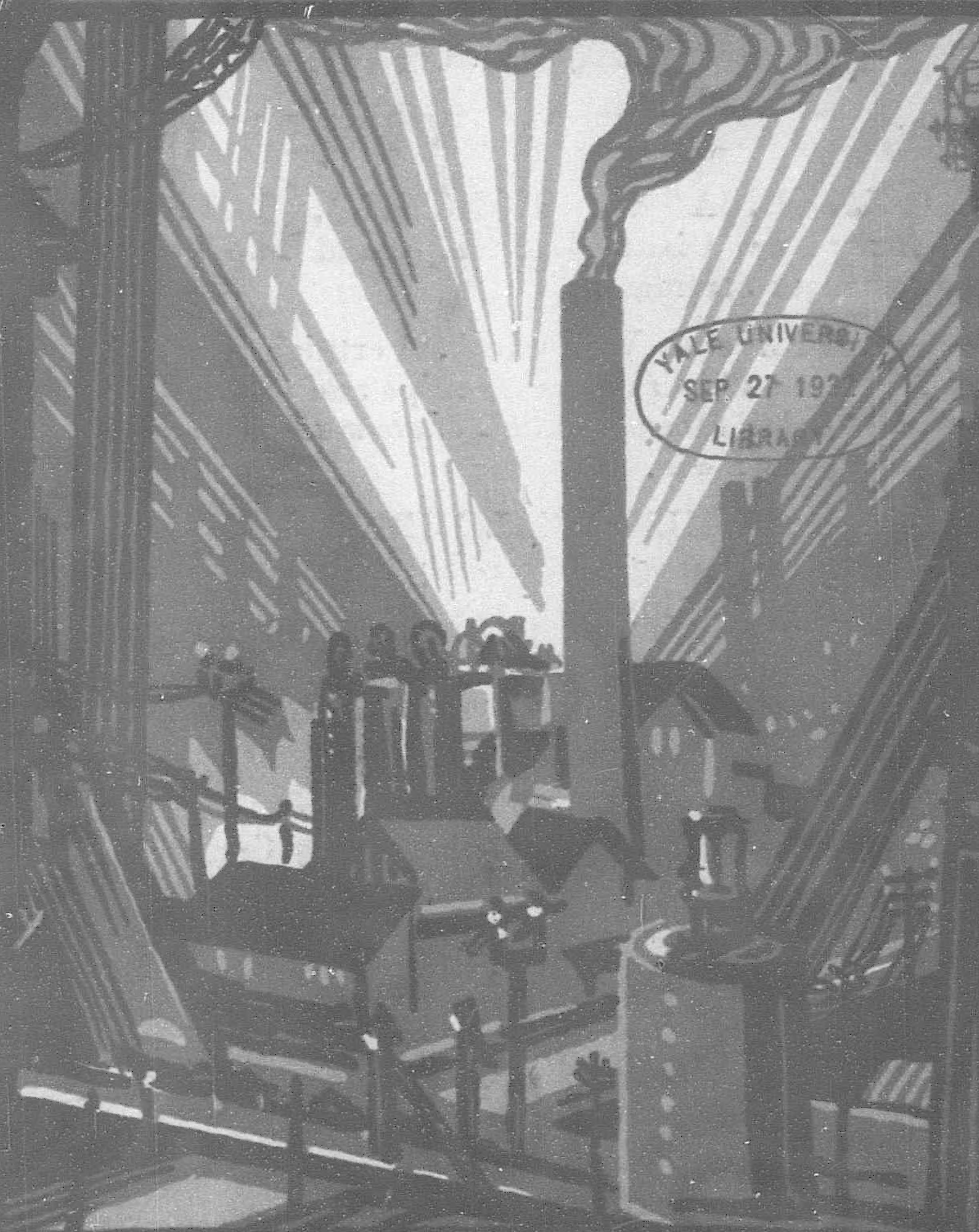


ENGINEERING

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THE FAR EASTERN REVIEW



上海黃浦灘念四號

遠東時報

MANCHUKUO AND JAPAN
INTERNATIONAL VIEWPOINTS
MANCHURIA'S TARIFF OPPORTUNITY

Vol. XXVIII

AUGUST, 1932

No. 8

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The Far Eastern Review

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Manchukuo and Japan

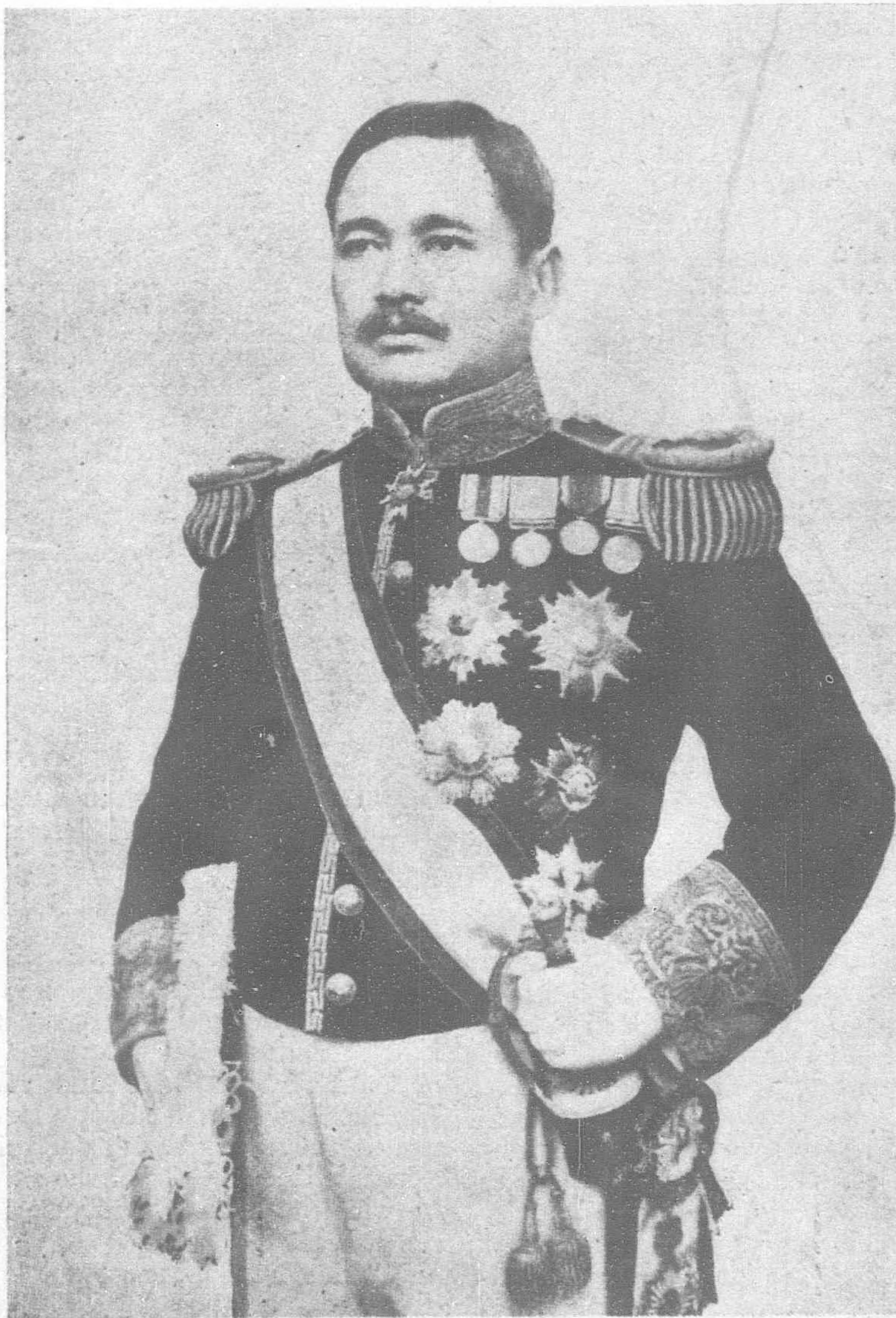
Foreign Minister Defines Policy of the Tokyo Government

"Manchukuo has set out upon an honest program that is open and above board. It declared its intention to pursue a policy of justice, peace and friendship towards other countries, to take over obligations of existing treaties according to international law and usage, to respect vested rights and interests of foreigners, and to protect their lives and property, to welcome all aliens and accord them equal and equitable treatment irrespective of their racial origin, to adhere to the principle of the open door, to promote international trade and contribute to the economic development of the world. Manchukuo's sincerity of purpose has been definitely established."

IN the view of Japan the new Manchukuo Government came into being "through the spontaneous will of the Manchurians themselves and should be regarded as a consequence of the fissiparous movement in China." This was enunciated in an address before the Japanese Diet on August 25, by the Foreign Minister, Count Yasuya Uchida, who employed the occasion of the speech to define the policy of the Japanese Government in the present situation. Count Uchida's speech was as follows:

"At the June session of the Diet, my predecessor took occasion to report upon and discuss the outstanding foreign relations of this country. To-day, in view of the importance of the developments that have taken place in Manchuria since then, I desire to review the situation in Manchuria and China proper and to describe, in some detail, the policy of the Japanese Government.

"We are all gratified to note that Manchukuo has entered upon a career of sturdy and healthy progress. The Japanese Government is convinced that recognition of this new State is the only means of establishing a condition for permanent peace in the Far East. And, it is with a view to early extension of formal recognition to Manchukuo that we are making various



Count Yasuya Uchida

arrangements, upon the expected completion of which in the near future, our plan will be carried through.

"However, there are those in other countries, who do not fully comprehend the attitude of Japan towards China nor the measures she has taken since the incident of September 18 last year, and who, in default of correct conception of the advent of Manchukuo, look upon any recognition of Manchukuo by Japan as an illegitimate procedure.

Clarifying Japan's Position

"In view of such a misunderstanding still persisting, I avail myself of this opportunity to clarify Japan's position and expound to you the reasons why the Government consider recognition to be the only means of solving the Manchurian problem, although in doing so I may have to repeat what already had been set forth in successive declarations and statements issued in the past by the Japanese Government.

"It is an indisputable fact that the chaotic condition in China and the so-called revolutionary policy carried on by China under the enthralling influence of extravagant political dogma have been principally responsible for the unfortunate turn that international relations have taken of recent years in the

Far East. Although Japan has been the chief victim of this abnormal state of affairs in China, other countries have also suffered intolerable indignities and incalculable material loss.

"At the same time, it is admitted by those conversant with the actual conditions in China that no remedy can be effected having recourse either to the Covenant of the League of Nations or to any other organ of what may be termed 'machinery of peace.' In fact, it has been the practice of the Powers, as has been demonstrated on innumerable occasions, to repair or prevent injuries to their important rights and interests in China by direct application of force without relying upon those instruments of peace.

"For over 20 years, Japan continued to exercise the greatest patience and moderation in the hope that some day China might soberly undertake the rehabilitating of her fortunes and play her proper rôle in the maintenance of peace in the Far East.

"China failed, however, to show any sincere desire to reciprocate our goodwill and kindly sentiments, but increased more than ever her arrogance and intolerance. Our Government took pains and time and again had to point out to China the danger she was running in trying the patience of the Japanese people. But, China did not heed our warnings.

"The incident of September 18 occurred in Manchuria, the very region regarded as the first bulwark of Japan, at the precise moment when the feelings of our people had been wrought up to the highest pitch by repeated provocations. We had no alternative other than to resort to measures of self-defense.

"There are those who argue as though the actions of Japan were in violation of the Kellogg-Briand Anti-War Pact. But, such contention has no foundation in fact. As I have stated, Japan has been forced to adopt necessary measures for prevention of wanton attacks on important rights and interests vital to her national existence. The Anti-War Pact does not put restraint upon the exercise of the right of self-defense in such a case. The Pact does not prohibit a signatory power from taking at its own discretion whatever steps it finds imperative in order to remove immediate menaces to its territory and its rights and interests of whatever kind. And obviously, the exercise of the right of self-defense may extend beyond the territory of the power which exercises that right. Japan's action is essentially identical with the action other Powers had taken elsewhere in similar circumstances.

"Following upon this action legitimately taken by Japan in the face of Chinese attacks, officials of the régime presided over by Marshal Chang Hsueh-liang either fled or resigned, as you know, with the result of a practical extinction of that régime.

"In the meantime, among leading people of Manchuria who had long resented the tyranny of the Changs and were opposed to plunging their land into civil turmoil of China Proper, a project for political reform was already under way. It is in every way natural that these leaders should have taken, as they did, advantage of the opportunity afforded by the downfall of Marshal Chang to launch upon an active movement. Peace Maintenance Committees were accordingly organized in Mukden, Harbin and in other centers. In view of our own responsibility in respect of the maintenance of peace and order in Manchuria, we extended necessary co-operation to these committees. It was Manchurian leaders connected with these committees who decided that the hour has struck for founding a new state. The establishment of Manchukuo was an outcome of a separatist movement having for its background the geographical and historical peculiarities of Manchuria as well as psychological characteristics of the Manchurian people.

"Those who seek to place upon Japan the responsibility for the Manchurian revolution, by tracing the independence of Manchukuo directly to our military operations, simply labor under ignorance of facts and their opinions miss the point altogether. Again, as regard those who fancy they detect secret connection of some sort on the part of Japan with the foundation of the new State, basing their suspicions on the fact that there are in fact a number of Japanese in the employ of the Manchukuo Government, I need only point to the existence of many precedents for enlistment by a young government or a newly-founded state of the services of foreigners. Our own Government, since the Meiji Restoration, employed many foreigners as advisers or as regular officials; their number, for instance, in the year 1875 or thereabout exceeded 500. Those who misconstrue the presence of Japanese in the Manchukuo Government, in the fashion alluded to are placing a responsibility where it does not belong.

"Incomprehensible" View

"Manchukuo has come into being, as I have already remarked, as a result of the separatist movements within China herself. Consequently, the view was expressed in certain quarters that recognition by Japan of the new State, thus created, would constitute a violation of the stipulations of the Nine-Power Treaty, is in my opinion incomprehensible. The Nine-Power Treaty does not forbid separatist movements in China, or debar Chinese in any part of the country from setting up of their free will an independent state. Hence should Japan extend recognition to the existing Government of Manchukuo, she would not thereby, as a signatory Power to the Nine-Power Treaty, violate in any way the stipulations of that Treaty. Of course, it would be a different matter on the assumption that Japan was seeking to annex Manchuria or otherwise satisfy a thirst for land. Only I hardly need to waste words in once more disclaiming at this juncture any territorial designs on our part in Manchuria or anywhere else.

"Thus far, I have elucidated the thesis that the attitude maintained by Japan towards China, and especially the measures we have taken since, the incident of September 18, have been just and proper, that the independence of Manchukuo has been achieved through the spontaneous will of the Manchurians themselves and should be regarded as a consequence of the fiaspious movement in China, and that recognition by Japan of the new State, thus created, cannot violate the stipulations of the Nine-Power Treaty.

"Now, let me proceed further and dwell upon the reasons why the Japanese Government consider recognition of Manchukuo as the only effective means of solving the Manchurian problem.

"With regard to the question of finding a solution for the Manchurian problem, the Japanese Government attach the greatest importance to the following two points; firstly that in seeking a satisfactory solution we should aim at the fulfilment of the legitimate aspirations of the Manchurian people,—with adequate guarantees for the rights and interests of Japan,—at prevention, in order to make Manchuria a safe place to live in for Manchurians and foreigners; alike prevention of any recrudescence of the erstwhile anti-foreign policy and movements, and finally at bringing not only stability to Manchuria but permanent peace to the Far East. Secondly, such a solution should be effected by rejecting all sentimental propositions and abstract theories and arrived at upon the solid basis of the realities of the situation."

"In view of the circumstances that led to the outbreak of September last and the immense sacrifices our country has been compelled to make in the past, the Japanese Government feel the imperious need for arriving at a fundamental solution of the Manchurian problem on lines along these two propositions, and of eliminating for all time the causes of the secular Sino-Japanese conflict.

"On the other hand, it appears that in certain quarters a plan is being considered to reach a solution by patching up the matter for the moment by investing China Proper in one form or another with authority over Manchuria. That such a plan would only serve to reproduce the situation preceding the incident of September 18 is only too plain for us who have been taught by bitter experience in the past. Japan can never consent to a solution of that kind.

"Moreover, it is as clear as day that investment of China proper with power over Manchuria, under whatever guise, is totally irreconcilable with the political creed enunciated in the declaration of independence and other public statements of the Manchukuo Government and therefore that scheme in question has no chance of being accepted by the Manchurians.

Unjust and Ill-Advised

"Imposition upon Manchuria of what is not wanted by the Manchurians would be unjust and ill-advised, in that it would only end by sowing seeds of future trouble in that land. A plan to invest China proper with authority over Manchuria, and all measures of a similar temporising kind, will never fulfil the object of making Manchuria a safe and happy land for both natives and foreigners, nor do they accord with our principle of finding a solution upon a basis of the realities of the situation. Certainly, it is not a way by which to bring stability to Manchuria or permanent peace to the Far East.

"Manchukuo has set out upon an honest program that is open and above board. It declared its intention to pursue a policy of justice, peace and friendship towards other countries, to take

over obligations of existing treaties according to international law and usage, to respect vested rights and interests of foreigners, and to protect their lives and property, to welcome all aliens and accord them equal and equitable treatment irrespective of their racial origin, to adhere to the principle of open door, to promote international trade and contribute to the economic development of the world. Manchukuo's sincerity of purpose has been definitely established.

"It is plain, therefore, that to extend to Manchukuo formal recognition and assist its Government to carry on their sound policy, above referred to, will be a notable step towards making Manchuria a happy and peaceful land for natives and foreigners alike on basis of the realities of the situation. And, it is plain, too, that such is the only way to secure a permanent solution of the Manchurian problem.

"As long as Manchukuo retains the sterling spirit on which it was founded and perseveres in its high purpose, it is assured of a future full of promise. Here and there we find persons entertaining an exaggerated fear of the perils of banditry in Manchuria or making a gloomy forecast regarding finances of the country. But, we refuse to join the company of these pessimists. Upheavals brought about by lawless elements are universal phenomena to be observed in newly-established states anywhere in the world. Whereas, in most of such cases, it takes some considerable time to put unrest down, it is only fair to say that in Manchuria the suppression of banditry is making comparatively rapid strides. As for the financial status of Manchukuo, I have been told that it is good,—really far better than it was anticipated at first by the Manchurian authorities. In view of the vast territory, a thriving population and immense natural resources in its possession, there can be no doubt that Manchukuo, given good government, will emerge as a rich and prosperous country and become a great market for the

world. It is my hope that a healthy development of Manchukuo will not only bring happiness and prosperity to the 30,000,000 inhabitants of the country, but will serve as a good example for rehabilitation of China proper.

Conditions in China Proper

"As regards conditions prevailing in China proper, I regret to say that growing disturbances in her domestic administration, coupled with rampant activities of communist-bandits throughout an extensive area in the Yangtze Valley and South China, is casting a gloomy shadow on the path of the National Government. Besides, as an anti-foreign, especially anti-Japanese, movement still continues unabated, further complications are likely to arise in foreign relations of China which, in turn, will make her internal confusion worse confounded. Truly, our deep sympathy is due to the Chinese people who have to suffer under these troubled conditions. To allow such conditions to persist as they are, I am firmly convinced, will not only constitute a constant danger in itself but will bring about a serious menace to the rights and interests of foreign Powers. On the contrary, the whole world will rejoice, should China realize the gravity of the situation, cast aside her ill-advised foreign policy and adopt in earnest a constructive program of devotion to the task of internal readjustment. It goes without saying that Japan, always conscious of the general interests of the Far East, will spare no effort to afford all possible assistance to China. Indeed, it is my fervent hope that the day is not far distant, when Japan, Manchukuo and China, as three independent powers closely linked together by bonds of cultural and racial affinities, will come to co-operate, hand-in-hand, for the maintenance and advancement of the peace and prosperity of the Far East as well as for the peace of the world and civilization of mankind."—*Rengo*.

International Viewpoints

UNDOUBTEDLY, more than ever before in all her long history, China in recent months has been "in the news" of the world at large. The Japanese-Chinese conflict, punctuated tragically with gunfire, brought this about and has focussed attention wherever newspapers are read.

To those who follow the current of news reports in the press of the world there has grown increasingly evident certain well-defined distinctions in different parts of the world, both with regard to the manner in which events in China have been presented in newspapers and with regard to the reactions of readers in different countries, as reflected in editorial expressions. It may be said that American journalistic methods differ in a marked way from those of Europe and due to this, doubtless, American reactions also differ from those in Europe and particularly from those in Great Britain.

The outbreak of fighting at Shanghai last January clearly marked the turning point of sentimental reaction in the United States and this struggle at Shanghai also had some effect on public opinion in Europe, though to a less marked degree than in America. It may be said, perhaps, that the whole outside world, although decidedly interested, was indifferent regarding the outcome in Asia up to the time of the clash at Shanghai. So long as Japanese operations were confined to Manchuria, in fact, a considerable sentiment in favor of the Japanese viewpoint was growing in the outside world. The strife at Shanghai changed all this in the United States, so far as newspapers in general disclose, and the gunfire at Shanghai plus the activities of a regiment of news correspondents shifted American sentiment definitely in favor of China and against Japan. This was not true throughout Europe and one may be permitted to seek causes for these differences of viewpoint.

It is probably all a matter of emotion. When the trouble at Shanghai began to take form the great newspapers of England for the most part were content to leave the situation in the hands of their regular correspondents resident in the Far East. These men through long years of experience had grown familiar with conditions in China and undoubtedly were able to gauge values and grasp

situations with a temperate unhurried understanding. What they wrote had some relation to events that had gone before.

A considerable portion of the American press is committed as a matter of circulation-getting policy to the "ballyhoo". This most articulate section of American newspaperdom loosed upon Shanghai its special correspondents in serried ranks and the circumstances of the situation enabled them to march into ring-side seats for the big show. No one will pretend that these men, and women, had any special background of knowledge of the affairs and history of the Far East. They came concerned only with the lurid happenings of the passing hour which were interpreted for American readers with whatever garniture and pyrotechnic embellishment fertile brains could evolve with the one aim of producing thrills to shock readers.

At a glance the seasoned sensation painters saw that the situation was to be handled to the best advantage—from a circulation building standpoint—in just one way. It was a whale of a "sob story" and that's the way it went to the States. And the emotional American public responded as ever it has responded—as it did in 1898, and again in 1917. The effect of all this ultimately and obviously was a terrific pressure from galvanized emotionalism on the American State Department, eased at length to a considerable degree by the emission of notes, letters and oratory. Directors of publicity in the United States long since have learned that it is a great, warm-hearted, idealistically-minded public that they have to deal with, and P. T. Barnum said that "one of them was born every minute."

Various reasons exist why public opinion in Great Britain crystallizes more slowly than across the Atlantic. It may be because their longer history affords a richer experience and due to this they are prone to cling to the verities. In general, the great English newspapers dispassionately have been presenting the facts and have been loath to emulate American methods of leaping to conclusions with handsprings. Some of the things they print reveal in a measure their angle of approach toward a given situation over a ground of stark realities. It amounts to a harsh, materialistic balancing a values, one against the other.

The beliefs of the sixties have fallen into disuse in the States and even the record of those times has been blotted out and has disappeared with a vanished generation whose memories have been dissipated, blown away by the saxophones of an era of pacifism and prohibition. English editors and English readers appear inclined to accept calmly the fact that human slaughter is a constituent element of armed conflict, that burning, bayonetting and murder all are a part of warfare and that these together with the most appalling atrocities take place even in riots and outbreaks of civil commotion.

So, in matter-of-fact phrasing, details of this sort that took place at the time of the Chinese and Japanese fighting all were, and are being duly reported in the English papers, but along with these things, to round out judgment, so to speak, one finds in these papers an element of sordid commercialism. As a balance for the sabreing of hapless victims the reader is given other slants, rarely to be found in American papers, that may have a bearing on the fixation of public opinion and explain in a measure why dissimilar views are held on different sides of the Atlantic. In the *London Times*, or in the *Daily Mail*, or in the *Morning Post*, or *The Financial Times*, or in the *Edinburgh Scotsman* the reader from time to time comes across items like the following, which is taken from *The Times* of July 11:

Chinese Loans in Default

During the last few days the subject of China's continual default upon a number of her external loans has been ventilated afresh by questions raised in Parliament. According to an answer given by Mr. Eden, Under Secretary to the Foreign Office, the arrears due from China on June 30 amounted to £4,210,569 and about 1,700,000 taels in respect of interest and £5,856,547 and \$78,000 (Chinese currency) in respect of amortization. On February 22 last a list was published in these columns of the various loans in default, and reference to it shows that only one modification is required to bring it up-to-date, namely that the Five per cent Shanghai-Nanking Railway loan, formerly in default on the sinking fund only, is now in default in respect of interest as well. The list, with this amendment, is set out below:—

Loan	Amount Outstanding
In default (interest and sinking fund):—	£
5% Canton-Kowloon Railway, 1907	598,500
5% Tientsin-Pukow Railway, 1908	2,695,000
Ditto Supplementary, 1910	2,011,500
5% Honan Railway, 1905	227,600
5% Hukuang Railway, 1911	4,864,200
5% Shanghai-Nanking Railway	2,552,000
5% Lung-Tsing-U-Hai Railway, 1913	4,000,000
8% Treasury Bills, 1918 (Marconi)	600,000
8% Treasury Notes, 1919 (Vickers)	1,803,200
In default (sinking fund only):—	
4% 1908	1,750,000
5% 1912	4,170,180
5% Shanghai-Hangchow-Ningpo Railway, 1908	525,000

Exactly to what extent the losses involved by these defaults are being borne by British investors cannot be ascertained, but the British proportion is unquestionably a high one, for the large stake taken by this country when these loans were floated has probably been increased further by the absorption of bonds which were sold by German, French and other Continental holders

during the period of currency chaos that occurred in the years immediately after the armistice.

The Disregard of Contracts

British investors well aware of the serious difficulties in which China has been placed as the result of many years of civil war, followed by the war with Japan and the severe fall in silver, have never been disposed to press unreasonably their claims for payment. They realize, for instance, that the disturbance caused to the Chinese economic life has meant a serious temporary curtailment of railway revenues, which form the primary security for the railway loans, and further, that before the railway systems can function again to their full capacity much capital will have to be expended on repairing damage done by military adventures and in making good arrears of betterments. But what the investor has a right to feel is that revenues upon which he has a prior claim are not being diverted to meet secondary claims, and, further, that in so far as she is able China is respecting her contractual obligations. Lately some uneasiness has been aroused by reports that revenues earned by the Tientsin-Pukow Railway, which might have been set apart for the bondholders, have been used for the building of a Ministry of Labor in Nanking. These reports have increased the restiveness of holders of Tientsin-Pukow bonds, in view of the fact that, in common with holders of Hukuang Railway bonds, they have by contract a claim upon the Customs revenue, and that the Chinese authorities have so far taken no steps to meet this claim, the upholding of which would end the default so far as those bonds are concerned.

The foregoing report reprinted from the *London Times* presents but one side of the picture with regard to the situation in China and the formation of public opinion in Britain on that situation. To round out this picture it is necessary to condense a number of other reports that have appeared recently in British newspapers. These have to do with a statement that was issued early in July by the London branch of the Yokohama Specie Bank announcing that South Manchurian Railway Five per cent bonds for £6,000,000 maturing on July 23 would duly be repaid on that date together with accrued interest. These bonds were issued in London in July 1907, and December, 1908, for £4,000,000 and £2,000,000 respectively, by Parr's Bank (now Westminster Bank), the Hongkong and Shanghai Bank and the Yokohama Specie Bank, acting as agents for the Industrial Bank of Japan, and were guaranteed by the Imperial Japanese Government. Later, on December 1, 1920, the Japanese Government assumed entire responsibility for the payment of the principal and interest of the bonds. At the time the statement was issued by the Yokohama Specie Bank in London the bonds were dealt in at 102. Regarding this matter of Japanese bonds one may quote from *The Financial Times* of July 7 as follows:

"Japanese credit already stands high and the punctual fulfillment of the £6,000,000 principal obligation worthily maintains the high standard already established.

"The operation is being carried out under difficulties. Japanese trade, like that of all other countries, has undergone contraction, and the Yen has depreciated from its sterling parity of 24.57d. to 18½d. This adds to the internal magnitude of the transaction and makes its accomplishment the more notable."—VAL.

Manchuria's Tariff Opportunity

HERE are some queer little angles about the Dairen Customs seizure, and the Customs of Manchuria generally, which help to heighten the interest in this little local question. From the exasperated declarations in the Chinese Press as reflecting the moods and observations of politicians at Peking and Nanking, one receives the impression that China Proper is prompting the Great Powers to the painful understanding that their property is at stake. For autonomy of Customs in Manchuria means a defection bound to broaden out and result in the complete breakdown of the Customs machinery, in other words the destruction of the debt-collecting department without which there can be no repayment of foreign loans.

A frank-spoken Chinese made a quaint remark on this point. He said: "It is very strange to me how the Foreign Powers are seriously concerned in having their loans collected and at the same time have been handing money back to China as fast as they took it in. They assessed China for the Boxer Rebellion, arranged for the collection of the money through the Customs Administration, and promptly agreed to give the money back again, each nation

following the other. If they are so little concerned in receiving these very large payments, and prefer to give them to China for the provision of educational funds which China will not provide for herself, I am certain they will not be willing to fight, or even make a fuss, if the other debts are merely threatened with non-payment."

Another thought occurs: Manchuria is not the originator of Customs seizure. Wherever revolutions, or rebellions, or declarations of independence occur, you will discover Custom Houses first in the big loot. Tibet had its Chinese Customs system at one time, seized by the Tibetans and severed from the Hart machinery. Mongolian posts of the Chinese Customs long ago were taken over by the Mongols for themselves. Loans to China from foreign countries, based on Customs revenues, had application to Tibet and Mongolia too; but never a murmur have we heard about their connection with the breakdown of the Customs integrity. Perhaps that was because there were no Japanese directly or indirectly concerned with the Tibetan and Mongolian Customs. If Mongolians, or Tibetans or Russians interfere with the integrity of the

Chinese Customs, or for that matter with the territorial integrity of China, all is well and nothing is said. But let Japan appear in the picture and horrified exclamations are heard on every hand and in all languages including the Scandinavian.

Too Much Timidity

The Manchukuo Government has made a blunder in this Customs action. It was too slow in acting. It should have grabbed on the day independence was declared. If Manchuria revolts against tyranny it ought to put a little force and fireworks into the business. There ought to have been a clean sweep right at the outset, Customs, Posts, anything and everything normally belonging to a regional government. The reason for delay may be found in timidity. The Changchun Government was afraid to offend the Foreign Powers.

That is no way to look at things. Manchukuo should realize at once that there is nothing to be gained from the Foreign Powers. It will have to rely on itself for everything. Let it expect help from the outside world and it will starve to death. There is nothing in this truckling attitude, this pleading for recognition and the like. Manchukuo is independent; then it must act that way and gain strength of its own accord and by its independent actions. Thus it will gain power and respect. Manchukuo must be ruthless and regardless of other people's feelings, beyond strict observance of its common obligations. If it will pay Manchukuo, and make it stronger and more prosperous to make friends with Russia, by all means follow that lead. Manchuria will learn the way to power is the path of independence that it seems to have been skirting this while past.

Applying this matter of independence and force to the Customs, the Finance Ministry ought to waste no time about tariff revision. Schedules that are good for China Proper may not be good for Manchuria. The rates ought to be scientifically worked out with regard to the special needs of Manchuria. No need to keep a parallel schedule with China Proper, although reciprocal rates may be arranged with the family to the south.

Logically one turns to tariff reciprocity with other countries. We are told Manchuria has no right to favor one nation over another in its Customs charges. This is not true. Manchuria may protect herself by tariff barriers, or help her trade by tariff cuts, without let or hindrance and without any violation of the Washington Treaty of 1922. That treaty prevents outside nations from seeking special privileges in China; nothing is provided which would keep from China such rights of administration over her own institutions as are granted to or taken by other nations. Manchukuo inherits equal rights. If it is all right for France to make a treaty with Indo-China, for Britain to make a commercial arrangement with Australia or for America to make a tariff deal with Canada as was attempted by the famous reciprocity proposals of 1911, it equally must be correct if Manchukuo trends the same way.

Observe this despatch from South America to a London newspaper:

BUENOS AIRES, Wednesday

In return for the inclusion of the main exports of the Argentine in the free list of the British tariff schedule, the Government has decreed a 50 per cent rebate in the duties of British distilled whisky.

The decree becomes effective from July 10. This concession, it is officially intimated on behalf of the Government, is the "first step in a commercial policy towards Britain which should extend by progressive developments." It is not in any way connected with the coming Empire economic conference at Ottawa.

What does it mean, at rock bottom? It means that Argentine is endeavoring to protect its export trade by making concessions in return for concessions made to her. She is cutting the duty on whisky out of no special love for a foreign country, but in necessary service to herself. Although it is regrettable that selfishness should rule the fiscal policies of individuals and states, it also is evident that unless a country looks after itself nobody else will. Argentine has no man-given rights that do not belong to Manchukuo; there is no authority to say that Manchukuo may not rearrange its Customs tariff if circumstances necessitate.

The War for Trade World-wide

The battle for world trade is going forward everywhere. Governments are trying to build up tariff barriers and other schemes,

such as reciprocity, for the protection of home industries and the greater employment of their own manhood. How serious this struggle is may be sensed by a consideration of several gold nations.

We are told that a vast slump in the value of international trade is revealed by the trade returns of the United States, France and Italy for the first five months of the year, and in the case of Germany for the first four months of 1932.

In each of the four countries both imports and exports have declined heavily compared with the same period last year.

America's exports have fallen by the enormous amount of £90,000,000.

In Germany exports for the first four months of 1932 have fallen by nearly £40,000,000, but imports have only fallen by some £10,000,000.

Germany's exports to Britain in this period have fallen by more than half compared with the same period last year, partly as a result of Britain's buy-at-home and tariff protection policy.

The following are the import and export trade returns of the four countries valued at par of exchange:—

UNITED STATES				Exports	Imports
				£	£
May, 1931	..	..	..	40,794,000	35,938,000
May, 1932	..	..	..	26,400,000	22,400,000
				- 14,394,000	- 13,528,000
Jan.-May, 1931	..	..	..	240,000,000	190,000,000
Jan.-May, 1932	..	..	..	150,000,000	128,000,000
				- 90,000,000	- 62,000,000
GERMANY					
Jan.-April, 1931	..	..	..	118,258,000	72,795,000
Jan.-April, 1932	..	..	..	80,315,000	62,210,000
				- 37,970,000	- 10,585,000
FRANCE					
Jan.-May, 1931	..	..	..	68,000,000	101,000,000
Jan.-May, 1932	..	..	..	54,000,000	49,000,000
				- 14,000,000	- 52,000,000
ITALY					
Jan.-May, 1931	..	..	..	44,689,000	58,165,000
Jan.-May, 1932	..	..	..	30,763,000	41,634,000
				- 13,962,000	- 16,531,000

In response to this condition they are using every reasonable plan to mend matters, and it is only right and fair that Manchukuo should enter the ring under conditions of equality with the others. In other words, having taken over the Customs, Manchukuo should employ the department to her own advantage.

The Seizure

Distance or the devil, cunning propaganda or cable-toll pruning have resulted in the Manchurian Customs incident reaching the reader of the foreign Press in such a way as to make it appear that only one thing has happened: The Japanese have seized the Manchurian Customs and poor China whimpers another pleading protest. Manchuria is a long way from the casual or hurried newspaper reader in Europe or America who cannot learn the peculiar conditions here or doesn't care to hear about them. But the headline says "Customs Seized" and the brief news story relates the bare facts. And those facts, paradoxically enough, are not facts if taken without explanation. The devil, of course, refers to such forces as are hostile to Japan for divers reasons, and have it in their power to present the news in a beclouded fashion. Propaganda in the hands of the aforetime meticulously unbiased Customs inspectorate permits the broadcasting of official state-

ments that, in the guise of foreign disinterestedness, puts the case for the Nanking government. Cable-toll pruning is a necessary business with newspapers managements in these days of lowered income, especially when cable charges across the Pacific are, for some mysterious reason, ten times the charges across the Atlantic. Hence lengthy Customs cables are discouraged.

The most reasonable of people could receive but one impression upon reading the following despatch:

Mukden, Manchuria—The Manchurian Government with the aid of Japanese, seized the Chinese Customs stations at Dairen, Antung, Harbin and other places in Manchuria to-day. The Chinese Government has entered a strong protest with the Powers, declaring the seizure will prevent their payment of foreign loans. British and American employees of the Customs are valiantly holding out at Harbin and Antung and resisting the invaders."

The summary is correct enough in some ways, but too bald to present a fair picture. In the way of fairness and thoroughness it ought to be said that Manchuria had right, precedent and authority for taking over its own Custom houses; that the "seizure" did not affect the payment of foreign loans in the slightest degree, because Manchuria guaranteed payment of the Customs quota; that China's protest to the Powers largely was instituted to embarrass Japan, but partly in irritation at being deprived of the Customs surplus, over and above the amount required to pay foreign loans; that the extraterritoriality of foreign Customs employees, and their claim on sympathy abroad was deliberately exploited by Nanking through their servant, the Inspector-General of Customs.

But the full story probably would befuddle the foreign reader if ever it reached him and if he had either the energy or the desire to go into the matter. Instead he receives that bare impression of China's Customs millions pirated by the Manchurian Government, who are supposed to be Japanese thinly disguised.

But the legislators, if they want to get them, can have the facts, so it is agreeable to notice Captain Eden, the Foreign Under Secretary, telling the British House of Commons that the Dairen Custom house was merely a device to stop smuggling. He has proceeded to the true core of the matter, and not all of the explanations of Sir F. W. Maze, the Inspector-General of Chinese Customs, can alter the truth.

An attempt is made by the financial interests of the Chinese Government, and under their dictation the Customs inspectorate, to make it appear that the seizure of the Dairen Customs is a Japanese move which interferes with the transmission of Customs revenue to Shanghai, violates agreements and spikes China's chances of repaying foreign creditors who look to the Customs for their money back.

Actually the Dairen Custom House was created as a convenience to China. The legal place for such a Customs collection machinery is along the frontier where the Japanese Leased territory comes against Chinese or Manchurian territory. Recognizing the difficulty of frontier collections, and the superiority of a centralized system at the Manchurian entrepôt close at hand, the Japanese Government permitted the Chinese Government to place a Custom house at Dairen. The permission was crystallized in the agreement of 1907. There is nothing in that agreement which makes Japan responsible for the Customs collections or revenues at Dairen. There is nothing in the treaty which gives Japan disciplinary authority over the staff of the Custom house. The proceedings which led up to the agreement, the preamble to the agreement and the treaty itself all show the singleness of purpose behind the establishment of the Custom house at Dairen.

Wrong Impressions

Sir F. W. Maze in his several statements and the Nanking Government have tried to give the world the impression of a Chinese Custom house, of a Chinese Customs trust fund, in Japanese territory, relying upon protection of Japan by written agreement yet ruthlessly violated. Such is a distorted picture.

The Inspector-General of Customs was dissatisfied with Mr. Fukumoto, the Customs Commissioner at Dairen, because that official had not remitted revenues collected at the port. Fukumoto had no orders from Japan to retain such funds. The I.G. discharged Mr. Fukumoto in a most irregular manner, in violation of that same 1907 agreement which Sir F. W. Maze invokes. For it is expressly stated that changes of personnel first must be communicated to the Kwantung Government and the Peking Legation

by the Customs inspectorate. Mr. Fukumoto thereupon joined the Manchukuo Government and began collecting Customs for Changchun instead of Nanking. Incidentally we should remember that the 1907 agreement was for a year only, and then was due for revision. It never has been revised.

Japan, however, is scrupulously careful of international agreements, and does not wish to give even the faintest impression of transgressions. If Mr. Fukumoto commences a Customs service for the Manchurian Government, and somebody else endeavors to operate one for the Nanking Government, the issue comes before Japan for adjudication. And Japan turns to the agreement. What does it find?

It finds that the Chinese "Government" in the meaning of the 1907 agreement, could be meant to indicate the Nanking Government or the Changchun Government. Both claim jurisdiction over the territory of Manchuria. Both demand the Customs revenues of the country. If anything the Nanking government has the stronger claim owing to its recognition by the Powers. Japan, then, stands in a difficult position inasmuch as she wants to do the right thing.

So the right thing ought to be the practical thing, as Solomon exemplified. The Dairen Custom house is a convenience for the territory of Manchuria. It is so perceived by the history and structure of the 1907 agreement. The thing for Japan to do is to serve notice on the parties concerned that the 1907 agreement is at an end, that it automatically has lapsed, and such being the case Japan desires the Chinese authorities to collect the Customs revenues at the Kwantung-Manchuria frontier for the time being—it might consider a new convenient agreement for Dairen collections later on when Japan has decided on its diplomatic status *vis-à-vis* the Manchurian Government.

If the Customs tariff is collected at the Manchurian frontier how will China, in the name of common sense, establish any collection agency there? Manchukuo will have something to say about that.

With respect to the repeated threats of the Inspector-General about non-payment of foreign loans there is an obvious answer. Manchukuo should pay the Manchurian quota (probably half of the total collections) into a foreign bank at the earliest opportunity, for the preceding month. Then announce the money is available for the Inspector-General at Shanghai to be used only for earmarked purposes, and upon conclusion of an agreement to that effect. If, afterwards, Nanking defaults on the foreign loans no blame can attach to Manchuria or Japan. Nanking may default on the domestic loans as a result of the arrest of the Manchurian collections, but that is not the business of Manchuria nor of the Foreign Powers.

So far we have the lawyer's way of treating the difficulty. There is another, which consists in saying: How can we expect Japan to help hostile Nanking to collect millions of dollars from Manchuria while Nanking is fighting Manchuria and incidentally Japan?

The Extrality Shield

Some dramatic and serio-comic sidelights on the Manchurian Customs transfer have accelerated interest in the proceedings. There have been spectacles of foreigners defying the Manchukuo governmental appointees charged with taking over the service, and likewise opposing the Japanese who were asked by the Manchu officials to assist in transferring control over the Customs offices at Harbin and Antung. We have been told about the British Customs Commissioner at Harbin refusing to be displaced, and hiding the keys. The play has been exciting, and good news abroad, where editors would not be making the most of their chances if they did not play up a picture of a lone Briton or a lone American holding out against great odds in the Manchurian war zone. Pistol play, shadowing by detectives, night searches of homes, disappearance of important documents—here are some of the elements of stories of derring-do. Who, in some far-off and adventureless land, reading of lonehanded feats, would fail to get a thrill from such good copy? And who would resist the impression that these foreign Customs employees are beset by the vilest desperadoes in the persons of Japanese agents and their Manchukuo pawns?

There is admiration for the loyalty of foreign Customs people who, though misguided, have clung to the old standard, refusing to surrender to the demands of local authority. The traditions of Sir Robert Hart and Sir Francis Aglen, those fine old guardians of the Chinese Maritime Customs on behalf of the Foreign Powers, inspired

these stout-hearted employees to some extent, although they should have remembered that former traditions were discarded by the present chieftain, Sir F. W. Maze, which sad fact ought to have inspired a change of attitude in the lesser servants of the once-great Customs institution.

General esteem for the resolution of the Harbin and Antung staffs will not lessen the fact that these foreigners were operating behind a shield—belief in the protection of extraterritoriality. Had these people been subject to the same conditions as the Chinese staffs, who are at the mercy of their own countrymen in governmental rôles or of the Japanese staffs under the discipline of their regional authorities, would they have shown the same independent spirit, and employed the same melodramatic methods of defiance?

Could it have escaped the consciousness of Mr. Prettejohn and the other people who have furnished us with such sprightly antics, that they were not subject to the local authorities, that their actions would be made much of abroad, that they were not likely to be thrown into jail and lost sight of, inasmuch as an ever-ready Press would demand their release?

Some sympathetic understanding must be accorded the Manchukuo Government, their officials, and their Japanese employees in this business. The ministers at Changchun decided as a matter of national policy, and as the right of an independent government, to take the Customs under their own administration. Knowing there is precedent to such action, no treaty or agreement preventing rearrangement of domestic administration, but merely an obligation to pay part of the revenues to a loan fund on behalf of foreign creditors, they put their decision into action. Officials and staffs were detailed to seize the Customs offices and records with as little fuss as possible, to safeguard the Customs funds and documents, and to keep the Customs functioning smoothly on behalf of the new administration. These people had their duty to do, and they proceeded to do it. They had authority and force behind them. Obviously the Customs staffs had but one path to take, and that was one of quiet submission. Foreigners in charge of the important stations should have reported to Shanghai that they had been displaced, and then should quietly have withdrawn, and have made no move likely to being the Chinese staff into conflict with the government of the district. Obviously any show of resistance on the part of a local Customs staff could have but one result. The fight was not between the Manchurian and the Chinese staffs of the Inspector-General at Shanghai, but between the two Governments concerned. By a show of resistance foreigners merely increased the difficulties of the men who were doing their legal work. Their own duty could not, by any reasonable canons, be open defiance of an authoritative *de facto* regional government, nor the making off with keys or documents which belonged to the office.

Under equal conditions the Manchukuo and Japanese police and others, who had been ordered to complete the transfer of Customs authority first would have warned members of the staff that they must submit, and if resistance still was found, have placed the offenders under arrest. But the conditions were not equal, as the foreigners felt they were protected by their home governments under the rules of extraterritoriality. The foreigners took advantage of the shield, and were encouraged to do so by Shanghai and Nanking directly or tacitly. The Manchurian officials did not wish to provoke any conflict with foreign governments, and delays resulted which interfered with the efficient transfer of the Customs posts.

Neither the foreigners nor the Manchukuo Government seems to understand that the extraterritoriality provision is not a form of protection. Special privileges are not granted to foreigners above the native people. It is wrong to suppose that foreigners cannot be prosecuted and arrested and held in prison if they are accused of breaking the laws of the country. If the Manchukuo Government will look into the matter they will find no legal condition permitting the foreigners to do things that cannot be done by the Manchurian or Chinese. But two things have contrived to put the foreigner in an untouchable position. There is first the reluctance of a cautious race to tamper with people and things they know little about. There is the tradition established by custom, giving the foreigner a sort of right to do anything and go anywhere. There is the misunderstanding of the scope of extraterritoriality.

In examining the latter point, we shall find that if Manchukuo has the purpose and finds the occasion, it may arrest any foreigner in Manchuria, but by the terms of the treaties must hand over such prisoner to the nearest consul of his own country, for trial according

to his own laws. It is interesting to note in this connection that as early as A.D. 654, by the Laws of the Tang Dynasty (Tang-leu, according to Sir George T. Staunton) foreigners were to be tried by their own laws, in cases of dispute among themselves, and by Chinese laws in cases of disputes with Chinese. No doubt any wholesale application of these rights would not be popular among the consuls, but the Manchukuo authorities may exercise their privileges to the full, whether or not Manchukuo is recognized by the Foreign Powers. There is ample precedent for foreign recognition of regional authorities in this regard, even to dealing with bandits, before and after the Lincheng gang. There is nothing so apt to drive home a *de facto* situation like the arrest of a foreigner by a regional authority.

Far be it from us to suggest that the Manchukuo Government go up and down the country arresting foreigners wherever they may be found, and handing them over to consuls with a request for their trial or expulsion. Where the peace and order of the territory is concerned, however, we are given to understand that the Manchukuo Government does not intend to brook interference from residents of any nationality, and they already have shown their temper by the recent arrest of a German who claimed to be a writer, but who was regarded as an enemy of the state. The man, after being held at Changchun a couple of days, agreed to leave the country rather than be taken before his own consul.

The discussion here of the privileges and limitations of extraterritoriality is not meant in the way of application to the Customs officials, but in the broader sense. Foreigners will take the reasonable view that the Manchurian Government is engaged in a very serious enterprise. It does not intend to allow any foreigners to imperil its safety or even affront its dignity. Residents of Manchuria should take the difficult position of the Changchun Government into consideration, and should endeavor to avoid any occasion which would add to its burdens, even as similarly they would do in China Proper. Extraterritoriality is not designed to permit non-Chinese nationals to do things they would hesitate to do in their own country, and Manchukuo intends to enforce that viewpoint, although it would prefer to live on the old-established terms of friendly co-operation with its guests.—*G. G. in the Manchuria Daily News.*

Activities in Manchuria

The Manchurian Republic, which has completed the organization of all government systems, is to proceed with the execution of the plans of developing all industries of the state by means of the national control of all principal industries, adopting the good points of the Soviet industrial policy.

Among the principal plans for the development of the country are the following:

1. Establishment of the City Planning Bureau to establish and enlarge industrial cities.
2. Exploitation of the unworked alluvial gold mines and other mineral mines as a State industry.
3. Development of the power industry. The supply of electric power by the power plants of the South Manchuria Railway Company at various places in Manchuria is insufficient, and the Manchurian Government is going to establish state power plants at many places. The first power plant probably will be established in the neighbourhood of Kirin by utilizing the waters of a river at the north of Kirin.
4. Monopoly of opium cultivation in Mongolia and Jehol.
5. Construction of national highways to aid the development of industries.
6. Establishment of State controlled extensive pastures in Mongolia for cattle raising.

Beside these, afforestation, clearing of land for cultivation, colonization and other enterprises will be carried on by the State.

The Manchurian Government is anxious to obtain funds for starting the enterprises from all sources. It is able to obtain about 50,000,000 yuen yearly from the customs receipts and the salt gabelle alone, and when all industries are developed the receipts therefrom will be very large, and the Manchurian Republic will be placed on a most sound base financially.—*Osaka Mainichi.*

Press Unfairness

(Manchuria Daily News)

UNFAIRNESS arising out of inaccurate and loose reporting, with Manchuria the victim, is exemplified in a typical instance brought to our attention. The *North-China Daily News* printed a despatch from its Harbin correspondent, with the date line June 26, which contains serious charges against the character of the Manchukuo government. The *Daily News* has a reputation for accuracy and justness quite above the character of this report whose entire substance has the appearance of a studied attempt to belittle both Manchuria and Japan. In view of the high standing of the celebrated Shanghai newspaper, journals in other cities place such confidence in its news columns as to reprint important articles. In this case the original report found its way into such another dependable newspaper as the *Japan Advertiser*, with the heading, based upon the subject matter, "Investors Dubious About Manchukuo—Men in control in Changchun said to be not inclined to assist foreign capitalists." The article broadcasts the impression quite at variance with facts, of a Manchurian door closed to foreign investors, and what is more, an official preference for Japanese financial firms.

Some of the objectionable statements from the faulty report are reproduced here, together with our observations based upon our own information and upon inquiries in official quarters. The paragraphs are numbered for convenience:

1.—"The more important question is, however, whether the Manchukuo government intends to permit foreign capital to participate in the development of the country or whether Japan proposes to hold the reins in its own hands. In Japanese circles the reply is that there can be no objection to foreign capital being invested in Manchuria, but at the same time, it has already become evident that the men who are controlling the government at Changchun are not at all inclined to assist foreign capitalists and in almost all cases favor Japanese banks, merchants and industrial magnates."

In these days of mad scrambling after timid capital it is laughable to hear the statement that anybody is likely to pick and choose among the lenders. Borrowers are roving the world over in the hunt after investors who have become almost as scarce as roc eggs. The question to-day is not one of "permitting" foreign capital to come into a country, but of luring it in by any sort of bait. We are being told with great repetition that Japan is having a hard time raising money in the markets of Wall Street and the bourses of the world, presumably for urgent requirements at home, and now we are asked to believe that there is so much Japanese loose capital available for Manchuria that it can afford to do without any other. Although the allegation is nonsensical it is harmful when scanned by the average reader abroad who may be led to believe Manchuria another Lhasa. The truth is Manchuria would like it known that the golden sovereign, the green-backed dollar, the French franc and the German mark, with other international currency brethren, have free admission to the country, without immigration quota restrictions.

2.—"Thus strict orders have been issued that all Manchukuo official buildings must be insured in Japanese companies only, and orders for many materials must be placed in Japan and not in any other country."

Here is more than a misstatement; it is a libel upon the Manchurian cabinet. Even if it were true I am quite certain the writer in the rumor-ridden jungles of Harbin would never be able to substantiate the fact, in which event he should hesitate to endanger the position of his employers by inviting judicial action. No such orders have been given. We have obtained a categorical denial of the charge, with respect to the insurance and orders for materials. If Japanese insurance companies and Japanese supply firms have secured a preponderance of orders that is quite another thing, which may be due to all sorts of circumstances. We might even admit that at the outset of its career the Changchun government found it more convenient to order through Japanese firms "on the spot," especially where materials could be delivered quickly. But to accuse the Changchun government of issuing "strict orders" to deal with Japan only is a matter which ought to prompt the premier or the foreign minister to demand an explanation from the newspaper and an apology carrying the same prominence as the accusation.

3.—"In Harbin the entire river front has been taken over by the Manchukuo government, which has given the monopoly rights to the Kokusai Unyu, a great Japanese forwarding company, which always gives special rates to Japanese against foreigners."

In this case we must reiterate the explanation that the river-front property known as Wharf No. 8 (not the entire river front), inherited from the previous government by the Manchukuo administration, hitherto had been rented by the Chinese Eastern railway. When the railway failed to pay rent the government took the wharf back and offered it to the public. The only proposition was from a Japanese firm. But it is stipulated that no discrimination of a racial or other character is permitted. Sensible people will understand that the Manchurian government will not favor Japanese over Manchurians in a case of this kind. Its aim is to win the esteem of its people, not to estrange them. In fact the Changchun officials are jealous of their racial independence and if there are any favors going it is more than likely that the Manchurians will get them. Human nature runs that way.

4.—"The question then is, how much foreign capital will eventually be permitted to come into Manchuria and in what lines will it be able to find a profitable investment?"

"Will be permitted" in this case must have reference to the owners of foreign capital. Any interested inquirer will secure from all departments of the government at Changchun the warmest expressions of interest in any capital seeking a home where it will have a chance to multiply.

5.—"Statistics issued by several Japanese authorities show that next to Japan, the United States and France are principally interested in Manchuria, though it is very doubtful whether these figures are quite correct, as Great Britain is much more interested than most people suppose."

On reference to the Manchuria Year Book, issued by the East Asiatic Economic Investigation Bureau, a Japanese concern, showing the imports and exports of 1929, we find that Japan led in the total trade of Manchuria with combined exports and imports of 261,728,000 Haikwan taels. China Proper was next with 189,069,000 taels; Asiatic Russia came third with 56,915,000 taels; United States fourth with 35,926,000 taels; Great Britain fifth with 31,227,000 taels. France is very far down the list. We are informed that the invested capital in Manchuria runs pretty much along the lines of trade development.

The doubt cast upon the veracity of "several Japanese authorities" is quite in line with the tone of the article, but at variance with facts. The South Manchurian Railway statistics, as those given above everywhere are accepted as authoritative, and but for such sources the world would be at a loss to compile statistical information. This applies to the League of Nations Mission.

6.—"It is hardly reasonable to expect that any foreign Power can lend money to a State which has not been recognized by anyone, and which might crumble to pieces at any moment."

A few lines forward of this statement we were assured foreign capital was being kept out by the combined machinations of the Manchurians and Japanese. Now it is the timidity of foreign capitalists themselves. Which contention are we asked to believe?

7.—"Unfortunately French capitalists have so far not been successful in Manchuria, and it will require very open door methods to be introduced, before they will be inclined to risk further money here. The Bank Franco-Asiatique which was opened a few years ago in Harbin and Mukden, has not had a brilliant time, the staff having already been reduced by a half and business now almost nil."

The reader is directed to believe that the absence of open door methods has impeded the success of French capital. There is absolutely no difference in the treatment accorded capital, and if there is more Japanese capital here, that is a natural outcome of geographical situation and national interest in this country. The bank referred to, which recently closed its Mukden branch, was not confronted by any adverse conditions that were not suffered by other banks during the depression, including the Japanese.

We feel sure the *North-China Daily News* will be glad to have attention called to the character of its reports, and will take the usual steps to ensure investigation and adjustment. The government of Manchuria is jealous of its status, and unwilling to allow itself be misrepresented. The responsibility of anyone living in the country, as well as anyone desiring to do business here, must be to place accuracy and fairness in the forefront of any statements referring to the ministers in charge of the delicate work of nation-building. Straight-forward criticism should be welcomed in Manchuria, but we are convinced that incorrect reporting and groundless charges against the government will not be tolerated.

The Electric Power Industry of Japan

U.S. Assistant Commercial Attache W. S. Dowd, Tokyo

JAPAN has developed the production of electric power to a point where it is now rated as one of the leading countries of the world in the distribution and use of electricity. This development has gone hand in hand with its general industrial progress since the war, and has been favored by a situation which has made it possible to make use of ample resources for the construction of hydroelectric power plants. The country is generally mountainous and has a large rainfall uniformly distributed and in dependable quantities. The rivers are generally short, but fall rapidly from the mountains to the sea, so that in some cases four separate plants can be erected at short distances so as to utilize the water without additional supplies. Except in a very few favored localities, such as Lake Biwa, large reservoirs with ample storage capacity are not available. For this reason, the development of hydroelectricity has been reinforced by steam plants situated in, or near, the large consuming centers.

Survey of Hydroelectric Possibilities

In 1912 the Government of Japan made a survey of the hydroelectric possibilities. The report indicates that at time of minimum flow there was available a potential amount of power amounting to 5,018,000 kilowatts. The average over a 6-months' period was 9,848,000 kilowatts. This survey indicated that there are available hydroelectric power plant sites which could be developed on a commercial basis to the number of something over 2,500. According to the latest figures, there are approximately 1,700 hydroelectric plants in the country, of which about 400 are operated by power companies for the exclusive sale of electricity. The rest are plants constructed in connection with railroad developments and for other industrial purposes.

The *Financial and Economic Annual* of Japan for 1931, published by the Department of Finance, states that the capacity of power plants in Japan amounted to 4,193,623 kilowatts, of which 3,188,452 kilowatts were for electric and railway company plants and 1,005,171 for individual industrial plants. The total number of plants was placed at 6,317, of which 774 were electric and railway plants and 5,542 individual industrial companies.

The total power generated in 1929 by all public utilities, including railroads, amounted to 13,312,000,000 kilowatt hours, according to the same source. Of this amount, 1,766,000,000 kilowatt hours were generated by the small, isolated, or individual, plants.

The distribution of power plants on a geographical basis indicates the reason why the development of hydroelectric power has been important in the industrial development of Japan. In Hokkaido, the northern island, there are 17 hydroelectric plants and four steam plants, with one hydroelectric plant under construction. In the northern part of the main island of Honshu, or northeast of Tokyo, there are 33 hydroelectric plants, four steam plants and three hydroelectric and one steam under construction. Located in central Honshu, near the large industrial centers around Tokyo and Osaka, are 143 hydroelectric plants and 36 steam plants, with 33 hydroelectric and three steam ones under construction. This situation is due both to the larger demand in these big industrial centers and to the fact that the topography of the country is such that the most favorable development is in the mountainous regions lying north and west of these two larger centers. In southern Honshu, west of Osaka, and including the island of Shikoku, there are 24 hydroelectric plants, 25 steam plants in operation, and three hydroelectric plants under construction. In the southern island of Kyushu 32 hydroelectric and 11 steam plants in operation, and two hydroelectric and one steam plant under construction are to be found.

Japan proper, then, has a total of 249 hydroelectric plants and 80 steam plants in operation, and 42 hydroelectric and five steam plants under construction.

The cost of electricity in Japan shows a considerable variation, although recent trends have been downward. Competition has been severe, owing to duplication and overlapping of service between the large companies. Domestic rates for lighting in the large cities

now run from 10 to 16 yen a kilowatt-hour (the yen equals \$0.498 at par, and approximately \$0.33 at present rate of exchange). Wholesale rates have varied largely and are fixed by contract between seller and buyer. In the past, these have been between 90 yen and 154 yen a kilowatt-year. Recent contracts between large companies have been made at around 103 yen a kilowatt-year on contracts for over 5,000 kilowatts a year.

Efforts are being made to stabilize the situation by agreements between large companies to end expensive competition and arrange for mergers, interconnection, and more uniform price rates. The Government and leading financiers have been active during the past year in trying to find some way to rationalize the power industry. One difficulty in plans for interconnection is the difference in frequency. Around Tokyo and in northern and eastern Japan all current is supplied at 50 cycles. In Osaka and southern and western Japan the frequency is 60 cycles. Recent installations of large generators have been equipped for double frequency 50 to 60 cycles, and where interconnection has been made, equipment had been installed to take care of the necessary change in frequency.

Pulverized coal for steam power stations is showing a strong tendency in new plants. Three of the largest steam plants completed during the past two years are those of the Nippon Electric Power Co., the Tokyo plant of the I. G. R., and the Kokura plant of the Kyushu Electric Railway Co. All are equipped according to the very best modern practice. A survey made by the Government 10 years ago showed that the cost of steam generated power was from 20 to 30 per cent larger than that of hydroelectric power. At that time the cost of coal was much higher than at present. Now coal suitable for pulverized fuel can be delivered around Tokyo for approximately \$2 a ton. Steam plants, however, operate under a handicap, owing to transportation costs. The bulk of the coal production comes from the northern island of Hokkaido and the southern island of Kyushu. The large industrial consumption of power is near Tokyo and Osaka in central Japan. It is stated that the cost of transportation from Hokkaido to Tokyo is equal to the cost of the coal at the mine.

The income of electric power companies has suffered during recent years, owing to severe competition and the general business conditions. The fall in the value of the yen will undoubtedly increase the burden on companies having payments to make on large foreign loans, although it is stated that current payments were arranged for on the old basis and will be met without difficulty. New loans are being made subject to mortgages, collateral security and with sinking fund provisions to an extent not required in the past. This is due to the desire of financial interests for protection to an extent not considered necessary previously.

With a return to normal business conditions, the power industry should show a decided improvement. Industrial developments are planned that will call for increased use of electric power. Normal growth of population and further extensions in the use of electric lighting will also contribute to increased demands. At present there are about 200,000 kilowatts of surplus capacity in the vicinity of Tokyo, and 600,000 kilowatt surplus in the country as a whole. This will soon be absorbed and plans already have been made for the construction of both hydroelectric and steam plants to meet the increased requirements.

Tokyo is already showing improvement. The Tokyo Light Co. reports that in December, 1931 total deliveries reached 348,000,000 kilowatt-hours, as compared with 276,000,000 kilowatt-hours in January, 1931—the first increase since May, 1930. The company believes that the low point in power consumption was reached in the summer of 1931. Reduction in rates is leading to increased consumption for power and lighting purposes. This has also caused the railways and large industrial companies to abandon plans for construction, or use, of individual plants of their own, except in a few cases where local conditions make such operations advisable.

Present installations, or plans for new steam plants, will take care of peak loads during the time of low water in hydroelectric plant generation.

Why Manufacturers Should Continue to Advertise Overseas

By T. M. QUINN, Vice-President, Dorland International, Inc.

Following is an address delivered by Mr. Quinn, at the Group Luncheon Session of the Export Managers' Club of New York, which was held in co-operation with the Convention of the Advertising Federation of America at the Waldorf-Astoria Hotel, New York, June 21. Mr. Quinn's task was to define the attitude of Advertising Agencies to the problem of export advertising in this present period of international commerce.

I doubt very much if there is an export executive to-day who is not a firm believer in advertising, and who does not desire more advertising than he is at present doing, to help sell his goods overseas.

It has been difficult this year to secure reasonable advertising appropriations from the board of directors, since few businesses are showing a profit, and generally speaking, the export department is expected to struggle along without advertising while in the domestic field it is still essential. At least, that is how most of the administrative heads of manufacturing companies feel to-day. But there are many pertinent reasons why manufacturers should continue to advertise overseas.

We are losing our prestige in the eyes of the foreign buyer, simply because we have deserted him at the moment when he most needs help. In many cases advertising support has been eliminated or very badly restricted. We are asking the distributor to carry the whole burden, and it is asking too much. We are not only asking the distributor to buy the goods, but to sell and advertise them. Foreign buyers to-day, when looking for agencies for American products, insist that the manufacturers advertise and support their efforts.

Every small manufacturer of unknown, unbranded goods is attacking advertised, branded goods. The present condition of the world to-day has opened the door for a wide open attack against advertised merchandise, and the louder the claim that advertised articles cost more, the more the distributor will listen, being perhaps compelled eventually to substitute a cheaper, unbranded line of merchandise. The distributor must meet price competition, and if he can sell an article at half the price, when American manufacturers are doing nothing to support his efforts from an advertising point of view, his resistance will eventually be broken down by the manufacturer of unbranded merchandise.

The distributor would rather sell branded, advertised products, since he knows it is a permanent business; but to-day he is out to sell every dollar's worth of merchandise possible, and the temptation to sell unbranded, unknown merchandise may be too great during the time of your inactivity. Small, local companies in foreign markets are beginning to flourish and profit by the educational work that American manufacturers have done through advertising. You have created tastes and desires for new products, unknown in many markets ten years ago, but you are now retiring from some markets or slackening your efforts through inability to spend as much money on advertising as heretofore. This is one of several reasons why gyp or local business is gaining in strength and reaping the benefits of the tastes and desires you have created. If something is not done to offset this type of competition, the small local manufacturer who is taking your place through the assistance of tariff barriers and exchange conditions, you will find a monster when you later decide to revive your old business.

Warnings Issued

Substitution has become so apparent that our newspaper and magazine friends have found it advisable to use their own columns to warn their readers against substitution of unknown, unadvertised goods. I have several clippings showing that a number of publishers in Cuba and Argentina are taking up the crusade against substitution to assist you, who are still advertising your products. It is pleasing to note that these publishers are alive to the situation

and are using their very best efforts to counteract this unhealthy, unfair competition. I doubt whether you appreciate this fact, as we, representing our clients, are going to ask every newspaper and magazine with whom we do business to further instill in the minds of their readers that standard, advertised products are safe to buy and usually the cheapest in the long run.

Here are a few headings of these advertisements which have appeared in the *Havana Telegram* and *El Hogar* of Buenos Aires: "Accept no substitutes," "Don't be duped," "Get your money's worth," "Read the advertisements," "Buyer beware."

I have before me a translation of an editorial which appeared in *Carteles* of Havana, Cuba, dated May 15, 1932, pointing out the serious situation which exists in Cuba, of local manufacturers imitating foreign products in name, carton, label, etc. Practice of imitation has long been known in one or two countries, but surely Cuba has not been an offender heretofore.

This condition also exists in several other markets and will continue to grow unless American manufacturers take courage and resume advertising their branded articles to the general public.

European Competition

Our friends in Europe have not recalled their traveling salesmen, as has been the case with many American manufacturers. They are making progress, replacing American products with those of British, French and German manufacture. While lower prices are still their mainstay, in securing orders, they have taken cognizance of the distributors' demands to advertise, since many of these distributors have been educated to the value of advertising by American manufacturers. Our European competitors are now using this new weapon, advertising, which we Americans were supposed to know best and have judiciously used during the past few years. The Prince of Wales has done his part toward convincing his countrymen that they must advertise or go bust, and they have taken his advice literally and very earnestly. You see more British, French and German goods being advertised in the foreign press than ever before. They are taking full advantage of America's present policy of "riding out the storm." And when the storm is over, we will find, much to our sorrow, that our worthy friends and competitors are sitting pretty, with the situation near what it was before the war, when British, German and French manufacturers enjoyed a healthy export business.

The rest of the world is looking to us for leadership. We have been the leader for a good many years in advertising the best products in the best possible manner. Our overseas friends are still looking to us for leadership, but how long can they continue to look to us for leadership without our actually leading the way? It is problematical whether we still retain our hard-fought position, and unless we help our distributors to sell their goods by advertising and good merchandising methods, we will eventually lose all that we have gained since the war.

How long will your distributor continue to have confidence in your product when you force him to play a lone hand? Up to quite recently you supported him with plenty of advertising in newspapers and magazines, window and counter-display material, direct-by-mail and other forms of sales assistance. Last year and this year it is very noticeable by its absence. The distributor no doubt has given you all the reasons why his orders are not as large as they used to be. These are not sufficient reasons why you should forget the distributor and his customers. You should advertise to some degree to keep your products before the ultimate consumer so that he will remember your product when he is in a better position to buy. The consuming public is very much like a politician in the witness stand—he doesn't remember. And strange as it may seem, the consuming public is not only fickle, but forgets your products very easily. You should retain the confidence that the

consuming public has in your product by advertising at least to the degree that the consuming public will know that your merchandise can still be purchased and that you have not passed out of the picture completely.

Export Still Profitable

I know of most of the trials and tribulations that the export executive faces to-day in the form of tariffs, embargoes on currency, depreciated exchange, lower buying power, etc. We, in the export advertising business also have our problems, and in many cases have had to become international bankers. Still and all, the sale of American products in the export field and the advertising of these products are still profitable. I believe most of you export executives can prove to your boards of directors that export business is just as profitable as domestic business. What difference does it make whether you sell in Texas or Mexico or China or elsewhere? The distance may be a little greater, but generally speaking, you get the same price for your products abroad as you do at home.

A domestic sales manager would not hesitate to make a flying trip of two or three thousand miles across the country to secure an order, but your board of directors would yelp like a "stuck pig" if you suggested a trip to Europe or to China at no greater expense, to secure an order of two or three times the size of the order which your domestic sales manager was securing from Texas. The difference is only a matter of opinion. The board of directors believe they know Texas, and figure the profits in dollars; but the order in China is so far removed and contains so many supposed mysteries which only the export executive is in a position to solve, that they, the board of directors, would rather spend in traveling expenses more money for the order in Texas than they would for the order in Europe or China.

Improved Conditions

Reports which we have just received from various offices and associates show that there is an improvement in certain markets and orders are commencing to trickle in to replenish depleted stocks. Reports from our friends in Spain indicate that the people are showing more confidence in the present government, and money that was outside of the country for safety is now finding its way back. Replacement orders are also reported by some of our clients as coming through from China to replenish depleted or destroyed stocks. The new government in Australia has helped to improve exchange and business in general. England and the Dutch East Indies are showing more life, and in the past week there have been indications that several countries are considering the advisability of lowering their tariff barriers as one step toward trade recovery. American manufacturers are no doubt securing some benefit from these improvements.

Manufacturers who have watched these improvements are now planning extra effort to sell more merchandise, and their efforts are influencing their distributors to get out and hustle for more business. Extra sales and advertising effort at this time will no doubt produce results. The Kellogg Company, manufacturers of Kellogg's Corn Flakes, All-Bran, Pep, etc., have increased their advertising appropriations and sales efforts tremendously—and they will secure results, since their plans have been laid most carefully and sufficiently energetic work is being placed behind their sales drive.

Publications are less crowded with advertisements, and your ads will secure a good showing and a more responsive audience, since it will not have to compete with many of your nonadvertising competitors. Courage is necessary, first to secure an advertising appropriation from your board of directors, and secondly, to make your advertising produce the desired results.

Advertising Appropriations

Although a manufacturer generally makes the same profit on his export business as he does on domestic business, the export portion of the business is compelled to get along on a smaller percentage of advertising, or, in some cases, to do on none at all. One of the main reasons why the export executive has been able to do as good a job as has been done in the past years is because of the low cost of space in foreign publications. Space costs in foreign publications are still low, and, in some cases the rates have been

lowered due to a decrease in circulation. The export agency, however, with its smaller advertising appropriations, is called upon to produce and render the same type of service as is rendered by the domestic agency, and it is only through the total volume of business that we are able to render the same type of service as the client receives from his domestic advertising agency. The export advertising agency works harder and longer hours for its profit, but those of us engaged in this work enjoy it and get a great deal of satisfaction out of it.

Shensi Oil Fields

The Nanking Ministry of Industries announces that the petroleum deposits around Yenchang Hsien, Shensi Province, are sufficient to supply the world with oil for 300 years. The announcement is based on a report from an American expert who has been investigating the oil fields in that area by request of the Ministry.

The petroleum belt at Yenchang Hsien is well known, having been investigated once before by Japanese and American experts in 1915 for the former Peking Government. In the same year, the Standard Oil Company, with the understanding of the Peking Government, conducted prospecting work in the belt but failed to achieve satisfactory results, due to a lack of transportation facilities and banditry.

Provincial authorities of Shensi started exploiting the more favorable fields in 1916. They succeeded in obtaining 100,000 gallons of oil during five years, but the enterprise again failed.

In view of the fact that China is importing annually about \$100,000,000 worth of foreign oil, the National Government is now seriously considering measures to utilize the petroleum deposits so that China may eventually become an oil-exporting country in addition to removing the necessity of importing a large amount of oil.

The Ministry of Industries has instructed the American expert to continue practical investigation and to report his findings to the Ministry at the earliest date. As the establishment of necessary transportation facilities is of first importance, considerable interest is attached as to whether foreign capital will be invested in the enterprise or not.

New Japanese Vessels

The Japan-Java service of the Ishihara Sangyo Kaiun Goshi Kaisha known as the I. S. K. Line, which was inaugurated in March last year as the result of an increase in trade between Japan and Java will soon be increased by two 6,000-ton steamers of the latest type. These are the *Nagoya Maru*, and the *Jehore Maru*, built at the Mitsubishi Dockyard in Nagasaki and the Harima Dockyard near Kobe. Both are the same type and size.

The *Nagoya Maru* was scheduled to sail on its maiden voyage from Yokohama on August 17 followed by the *Jehore Maru*, which will be placed in service some time in September. Before the *Nagoya Maru's* departure, the ship will be open for public inspection and a large number of people interested in shipping will be invited on board on August 16.

The new addition to the I. S. K. line was designed to accommodate 59 passengers, first and second class, in addition to usual facilities as a freighter. She has a cargo capacity of 8,800 tons. The ship has an average speed of 15½ knots per hour, is 405 feet in length, 55.6 feet beam and 32.6 feet draft.

It is fired with pulverized coal, the type being the first of the kind ever constructed in Japan and its operation condition is looked forward to with keen attention by Japan's shipping and industrial circles.

The I. S. K. line has at present six liners in service between Yokohama and Singapore, one ship sailing each fortnight. They are the *Malta Maru*, *Clyde Maru*, *Erie Maru*, *Boston Maru*, *Nilan Maru* and *Havre Maru*, each of about 5,500 tons gross. Ports of call made by its liners Nagoya, Osaka, Kobe, Macassar, Sourabaya, Semarang, Batavia, Singapore and others.

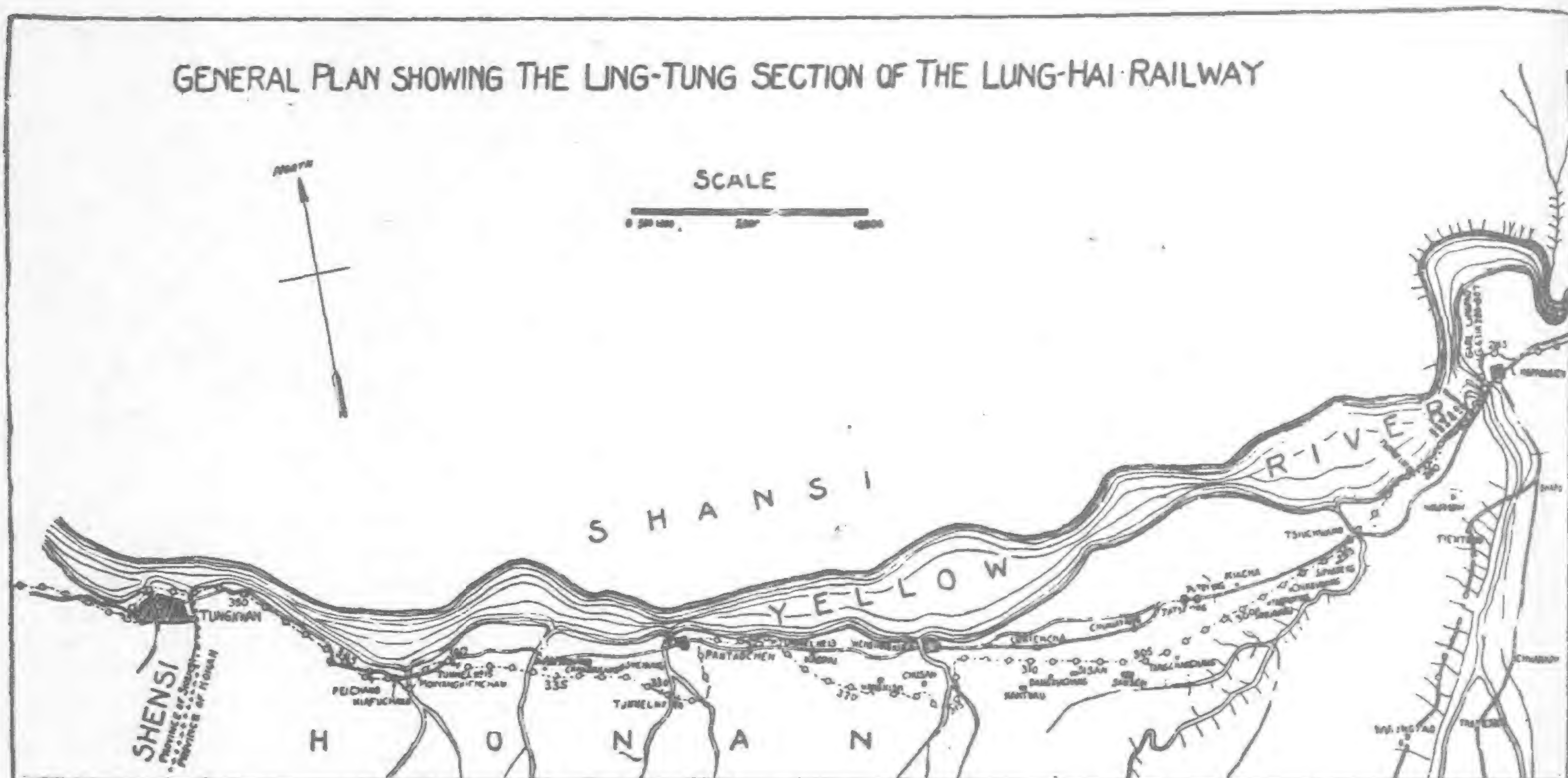


Fig. 2.—Section Lingpao-Tungkwan 72 km. nearing completion

Progress of Extension Work on Lunghai Railway*

By H. H. LING, Assistant Director, Lunghai Railway, In Charge Construction Section Lingpao-Tungkwan; Director and Engineer-in-Chief, Section Tungkwan-Sianfu

THE Lunghai Railway is at present the only east-and-west trunk line in the central part of China. It extends to the sea with a proposed Silientao Harbor in the east, and with Lanchowfu, the capital city of Kansu Province, as its western terminus. This line, when completed, with a length of 1,600 km., will, undoubtedly be one of the most important trunk lines of the country, politically, economically and culturally. From the engineering point of view, the western section of the line passes through the typical loess formation along the Yellow River with heavy earthwork, tunnelling, and many crossings over deep valleys. It has the longest tunnel of the Chinese Government Railways, tunnel No. 4, at Siashiyi, about 220 km. west of Chengchow, with a length of 1,779.58 meters, partially through rock. The present extension work also passes through difficult regions with heavy tunnelling work and interesting projects. Despite the fact that this line offers so many features of engineering interest, very little is

known to the profession, and very little has been written elsewhere in other papers.

Present Situation

The accompanying diagram (Fig. 1) shows the Lunghai Railway with operating section, Tapu to Lingpao, 826 km.; construction section, Lingpao to Tungkwan, 72 km., also Tungkwan to Sianfu, 130 km. The rest of the line, Sianfu to Lanchowfu, about 660 km., only been reconnoissanced.

When the line reached Shanchow in 1924, further extension from Shanchow to Tungkwan, 98 km., was continued. Owing to lack of funds, only 26 km. of line, from Shangchow to Lingpao, was completed and operated in 1926, and the remaining section, Lingpao to Tungkwan, 72 km., with a certain amount of work started, was unable to be carried on.

*Journal of the Association of Chinese and American Engineers.



Tson Sang Bridge Ready for Erection



Launching First Span of the Lingpao Bridge

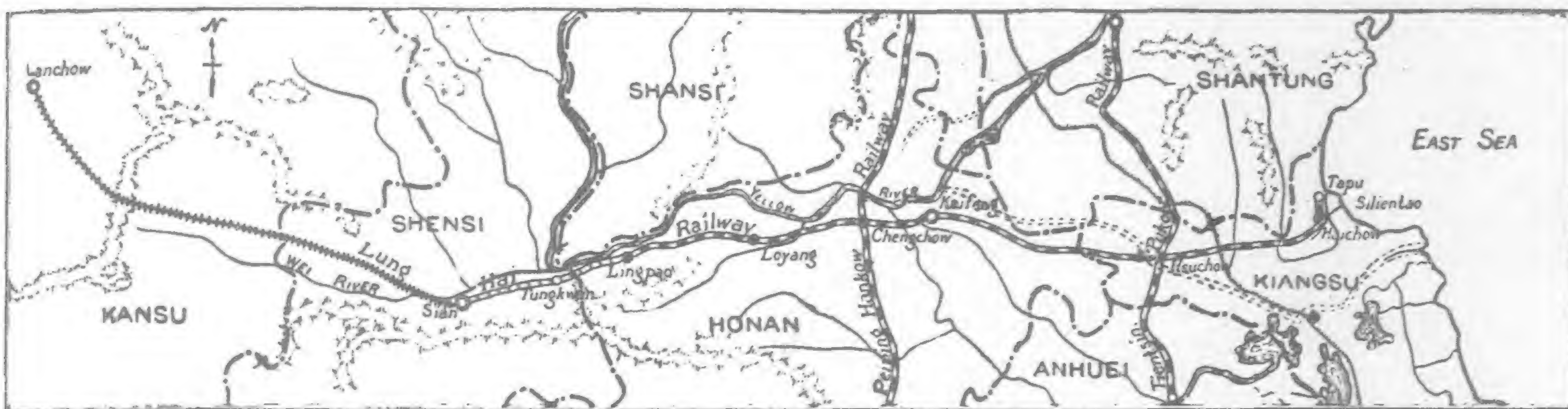


Fig. 1.—General Plan Lunghai Railway

About a year later, as a result of negotiation between the Governments of Belgium and China, on the disposal of the Belgian portion of the Boxer Indemnity Fund, 40 per cent of the Fund amounting to approximately G. \$1,800,000, was appropriated to the Lunghai Railway for the buying of materials in Belgium with the object of early completion of the section. The amount for bridges, rails and steel sleepers for the section did not require the entire portion of the appropriation, and, as this fund could not be used to pay for the construction; for labor and other materials, its balance was used to buy a number of locomotives and cars from Belgium for the operating section. This then paid back the cost, out of its operating revenue, to finance the construction. With this scheme carefully planned, the remaining work of this section was able to be continued and to approach completion.

Difficult Transportation

When the construction work of this section was resumed at the end of 1930, after the suspension of nearly a year, the transportation of large quantities of various materials from the seaports of arrival to the worksite became the first difficult problem for the railroad officials to solve. These materials included about 8,200 tons of rails and accessories,

3,300 tons of steel sleepers (50,000 pieces), 2,500 tons of bridges and about 500 tons of iron and steel products, all the above being scattered in Woosung, Pukow and Tsingtao; about 4,000 tons of wooden sleepers to arrive at Tapu (the present river port of Lung-hai), and about 6,000 tons of cement to be taken at Tangshan.

All these materials, amounting to some 25,000 tons were mostly over 1,000 km. from the work-site. With the general shortage of rolling stock, particularly locomotive and flat cars for bridges and rails, the handling of these materials to the work-site was by no means an easy task. Besides these materials, the railroad had to handle large quantities of stone and ballast, the former over a distance of 70 km., and the latter for a much shorter distance. Thanks to the friendly help of the Tsinpu, Kiaotsi, Peining and Pinghan Railways, the matter was greatly facilitated.

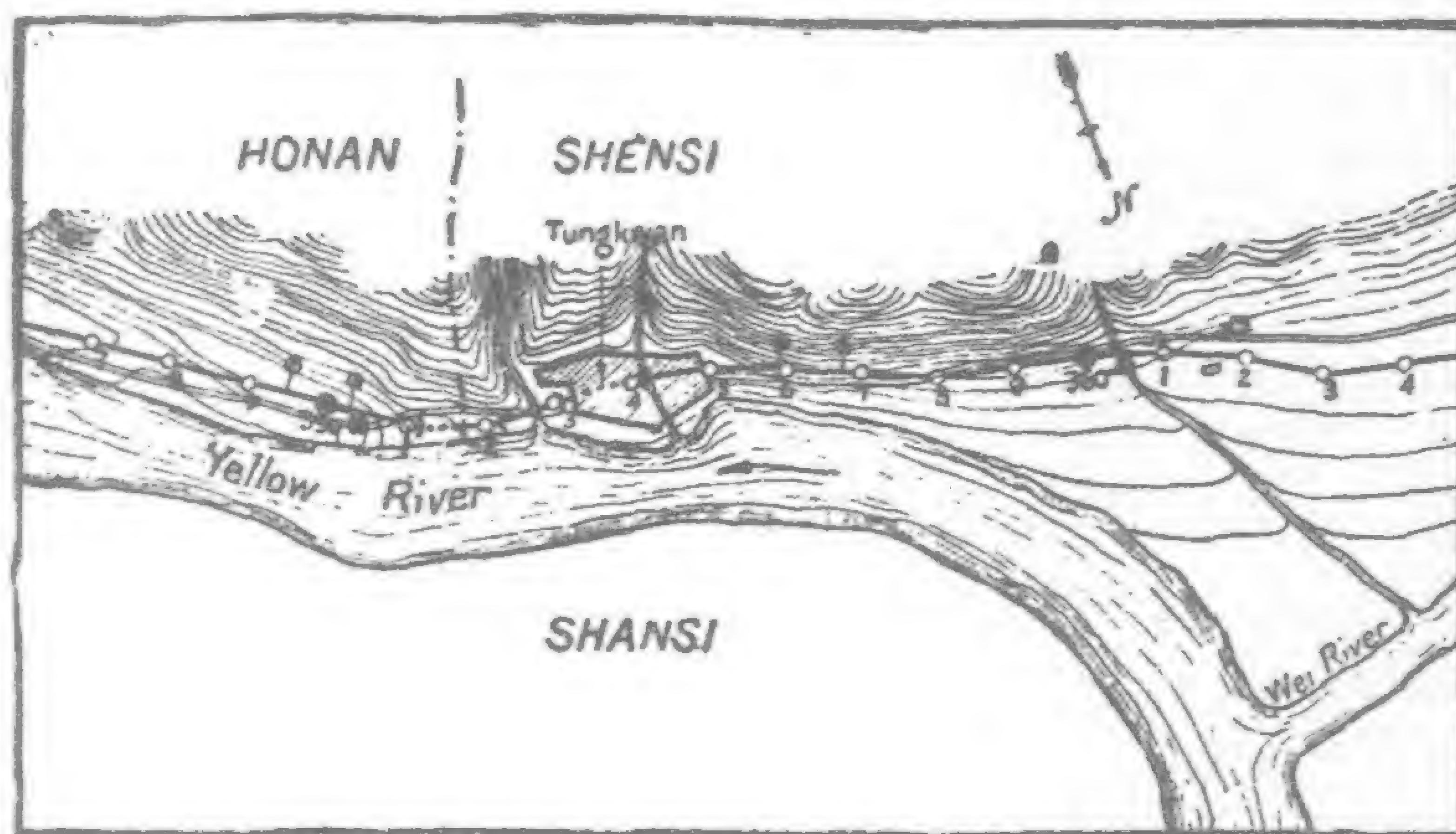


Fig. 3.—Tungkwang City and Vicinity

Lingpao-Tungkwang Section, 72 km.—Difficult Work

Fig. 2 shows the general plan of the section Lingpao to Tungkwang now nearing completion. In this section, the line lies along the south of the Yellow River with several points very close to the river. Going over the loess formation with sudden rises and falls, it necessitates frequent tunnelling, heavy cuttings, high embank-

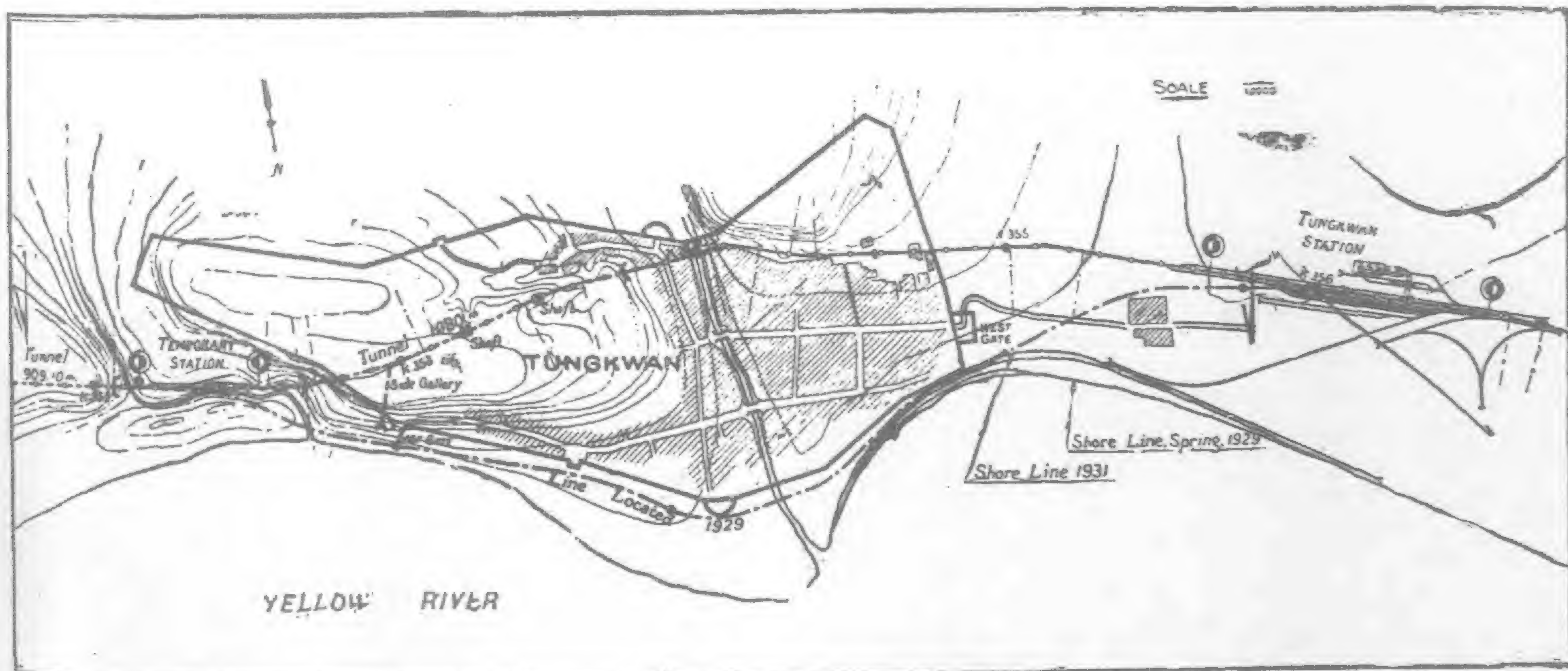


Fig. 4.—Tungkwang City showing Tunnel and Station

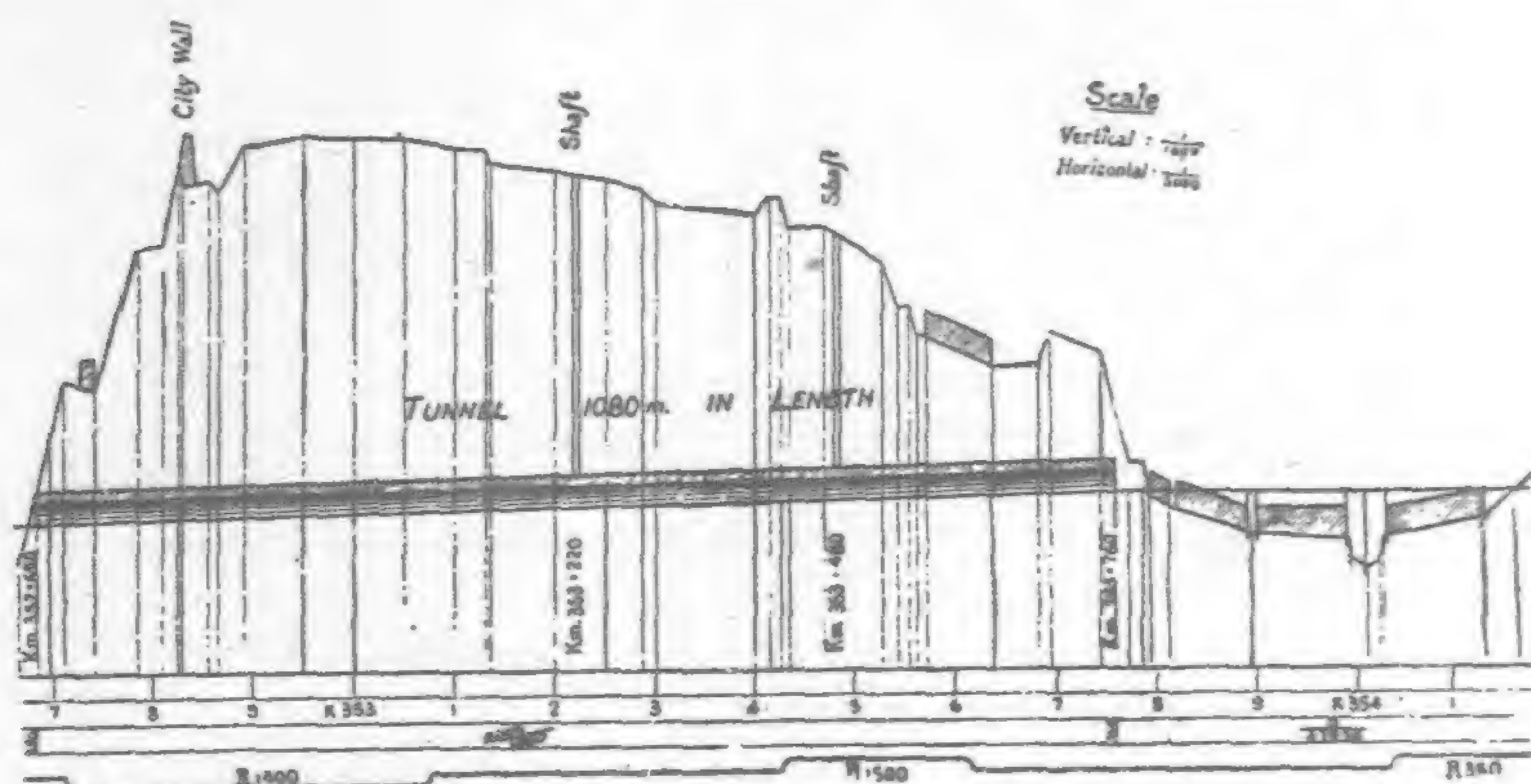


Fig. 5.

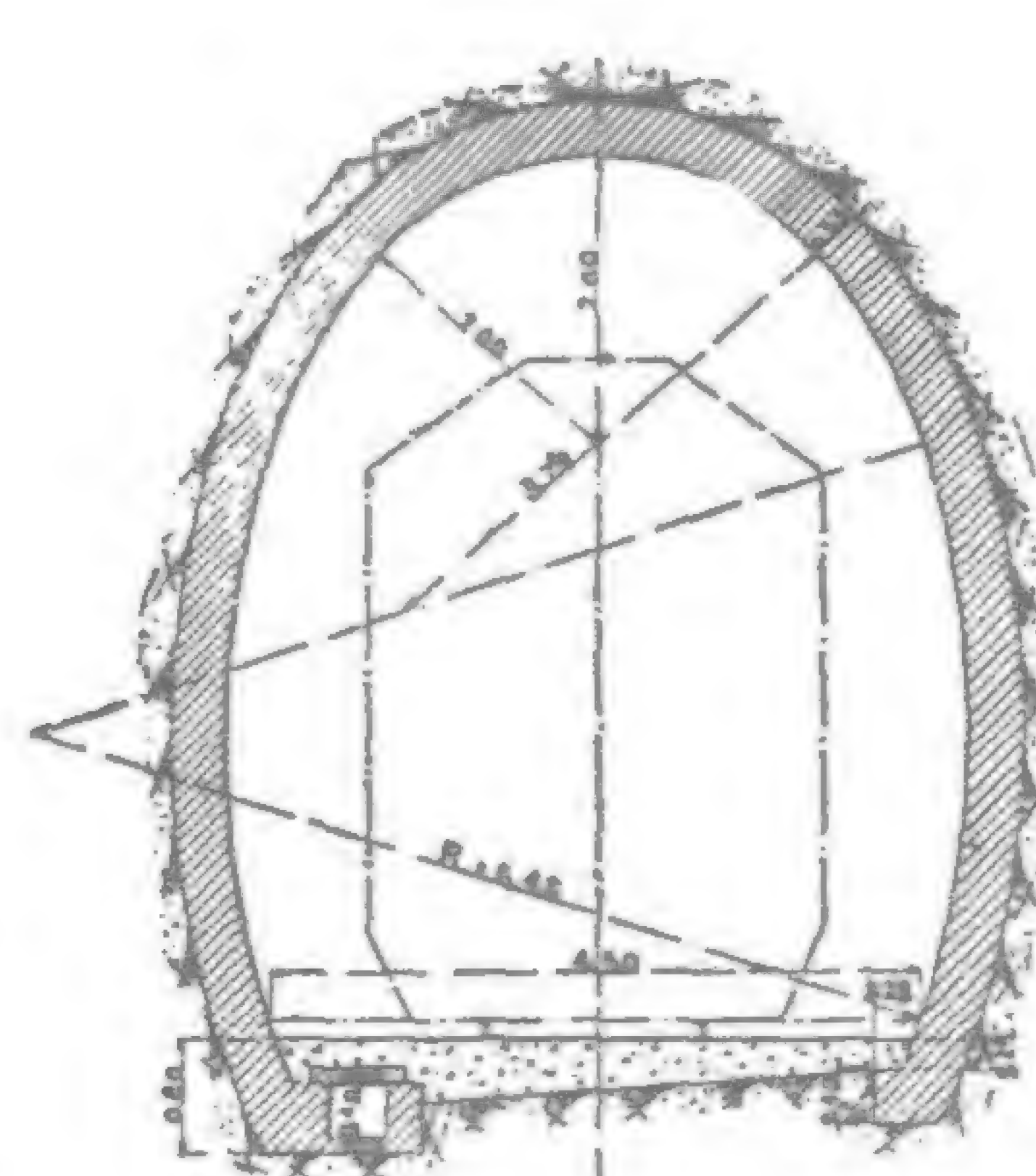


Fig. 6.

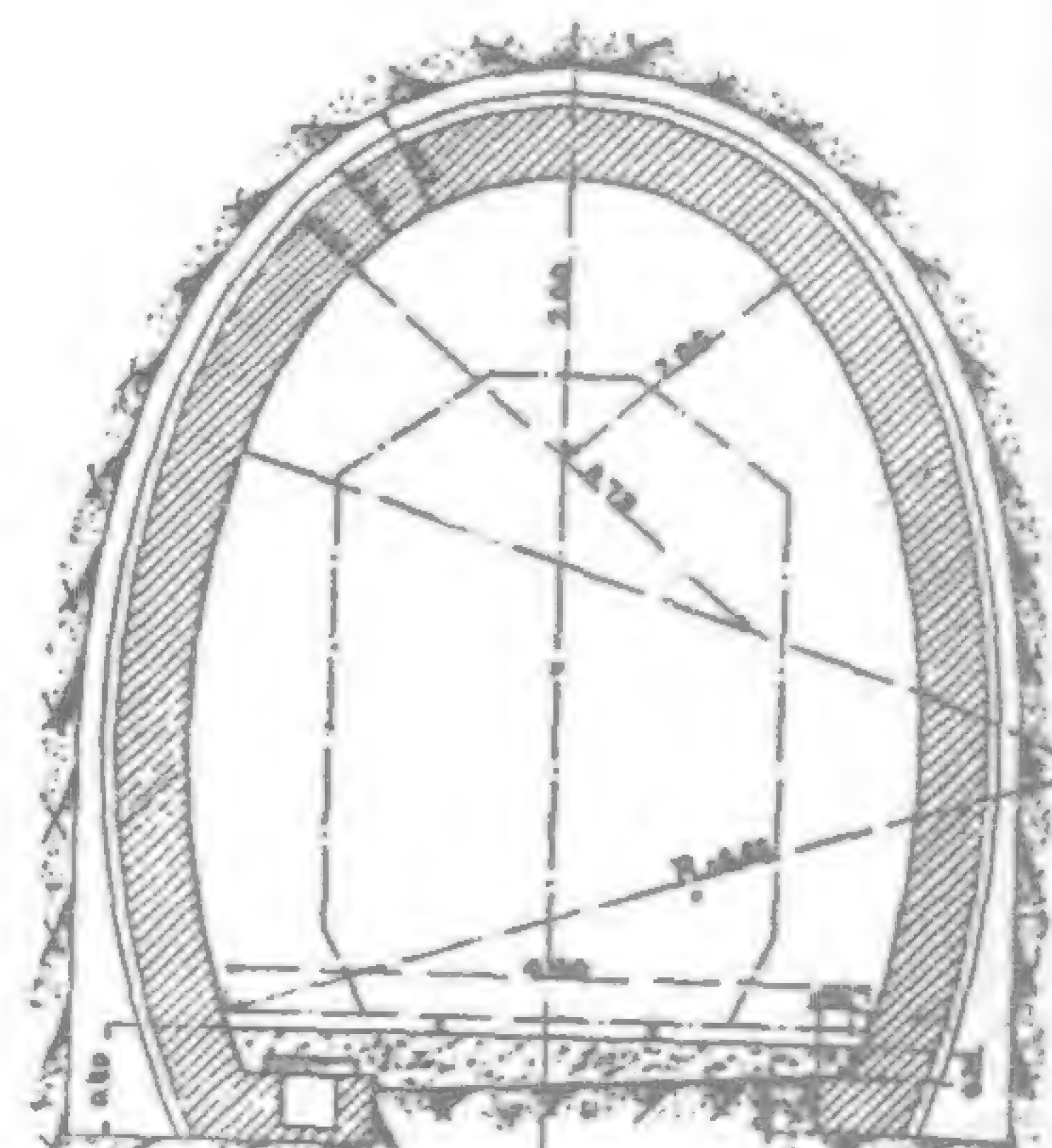


Fig. 7.

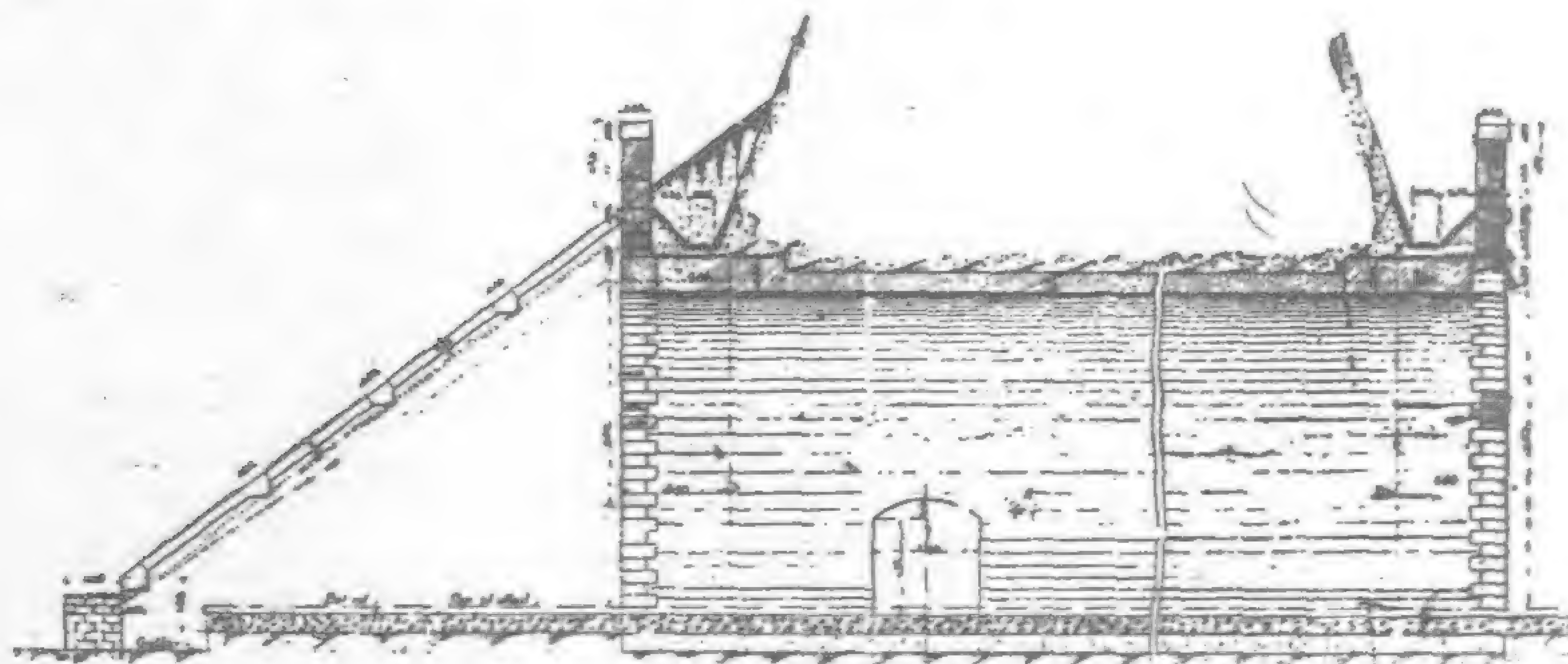


Fig. 8. Typical Longitudinal Section

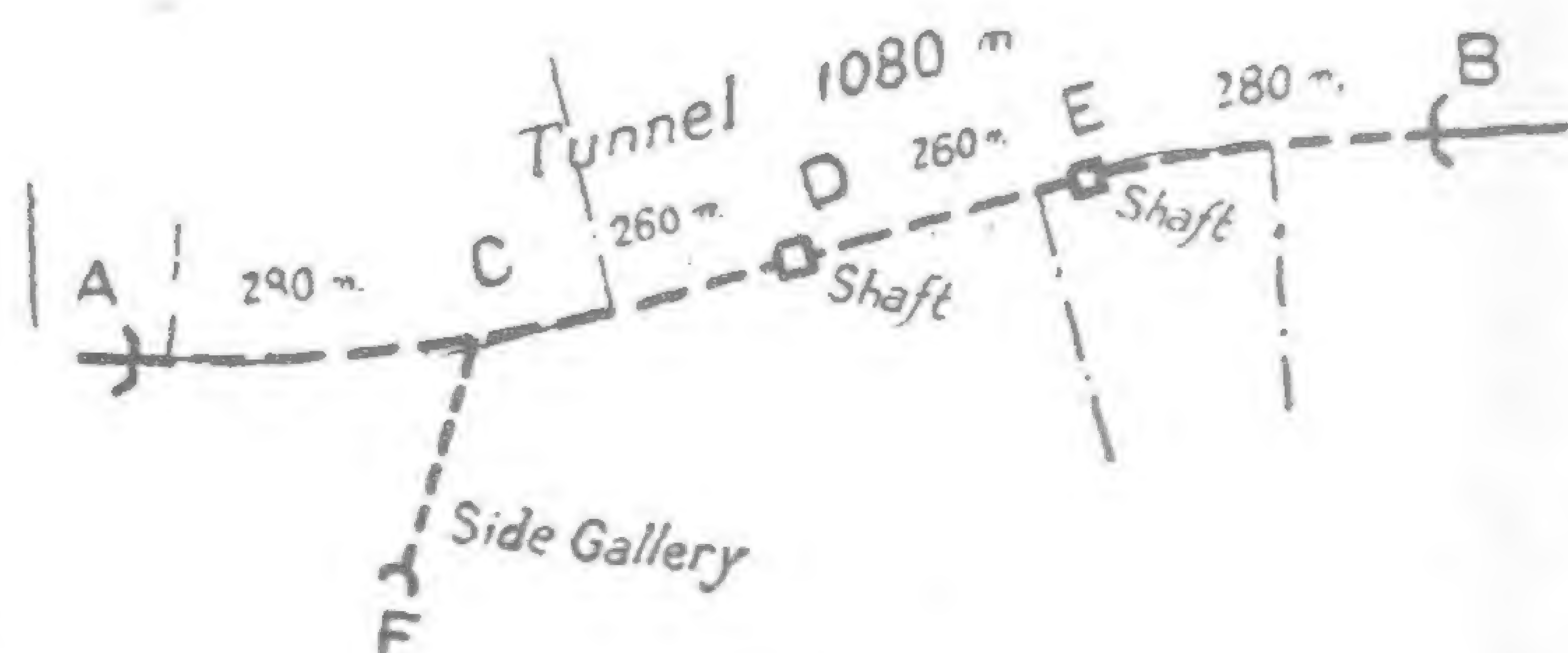


Fig. 12.

ments and crossings of deep valleys. There are 10 tunnels in this section, their length, alignment, and the progress of work up to the end of August, 1931, being as follows :

No.	Length	Grade	Curvature	Per cent completed
1	90.50 m	0.008	R=600 m	100%
2	621.20	0.008	600	100
3	90.30	0.008	—	100
4	107.40	0.008	—	100
5	622.60	0.007	{ 350 } 600	100
6	695.00	{ 0.010 0.009	{ 1,000 } 500	100
7	631.84	0.0062	—	100
8	395.00	0.010	1,000	100
9	909.10	0.010	1,000	95
10	1,080.00	0.005	{ 1,400 1,500	Work started Aug. 1, 1931.

Between tunnels four and five, there were two more tunnels projected and actually started, one with a length of 788.12 meters, and the other 592.00 meters, very close to each other. On account of military disturbances the construction work of these tunnels was forced to stop before the lining of the arches was put on, and as a result, they both showed cracks of various degrees, and were later on considered unsafe to continue. These tunnels were then substituted by a "Variant" along the Yellow River, and, since its completion, the "Variant" has shown a considerable degree of safety even as a permanent substitute, and the future tunnels may not become necessary at all when the present "Variant" is properly improved and maintained.

The last mentioned tunnel in the above table is located at Tungkwan, the general design and method of construction of which will be found in the latter part of this paper.

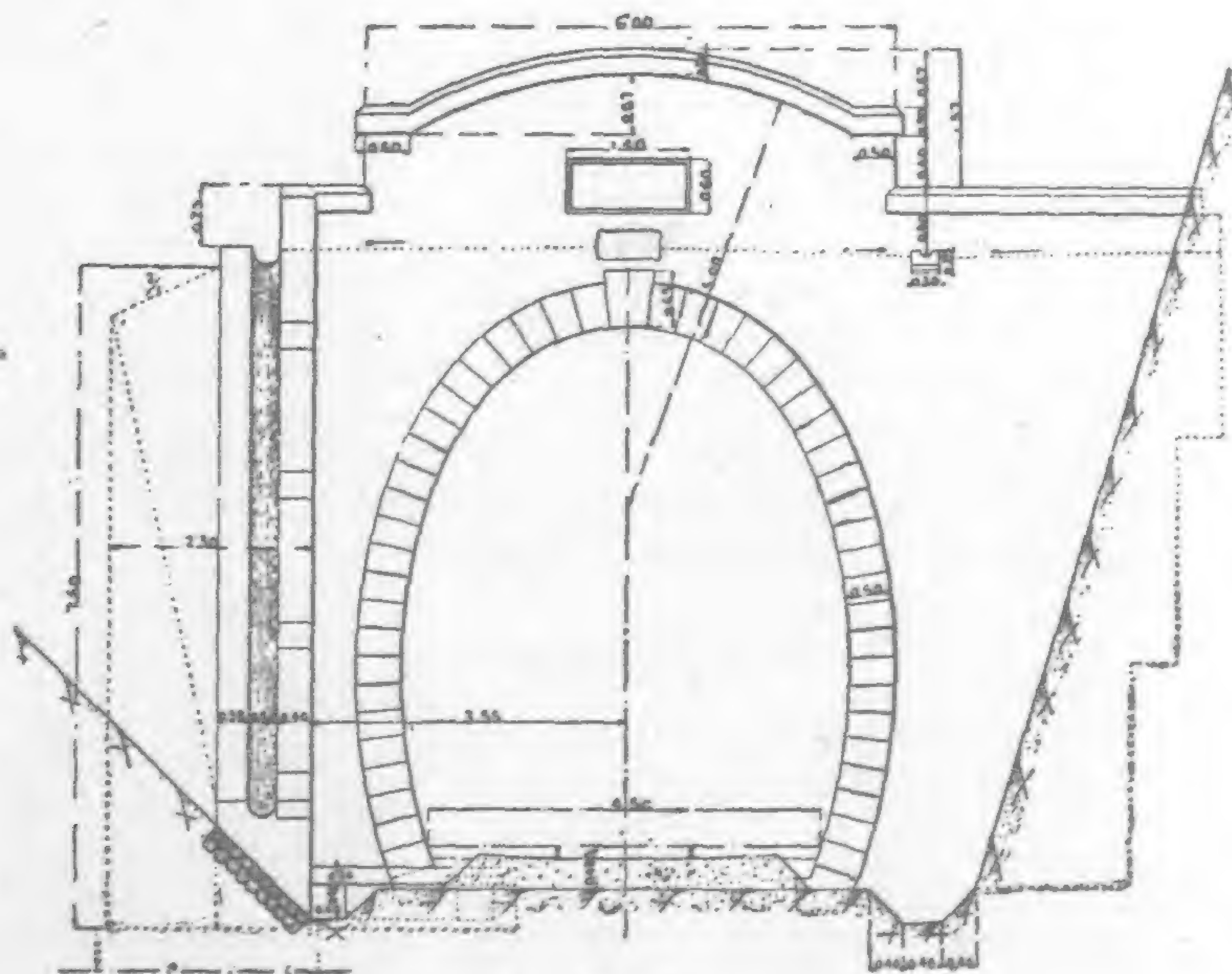


Fig. 9.

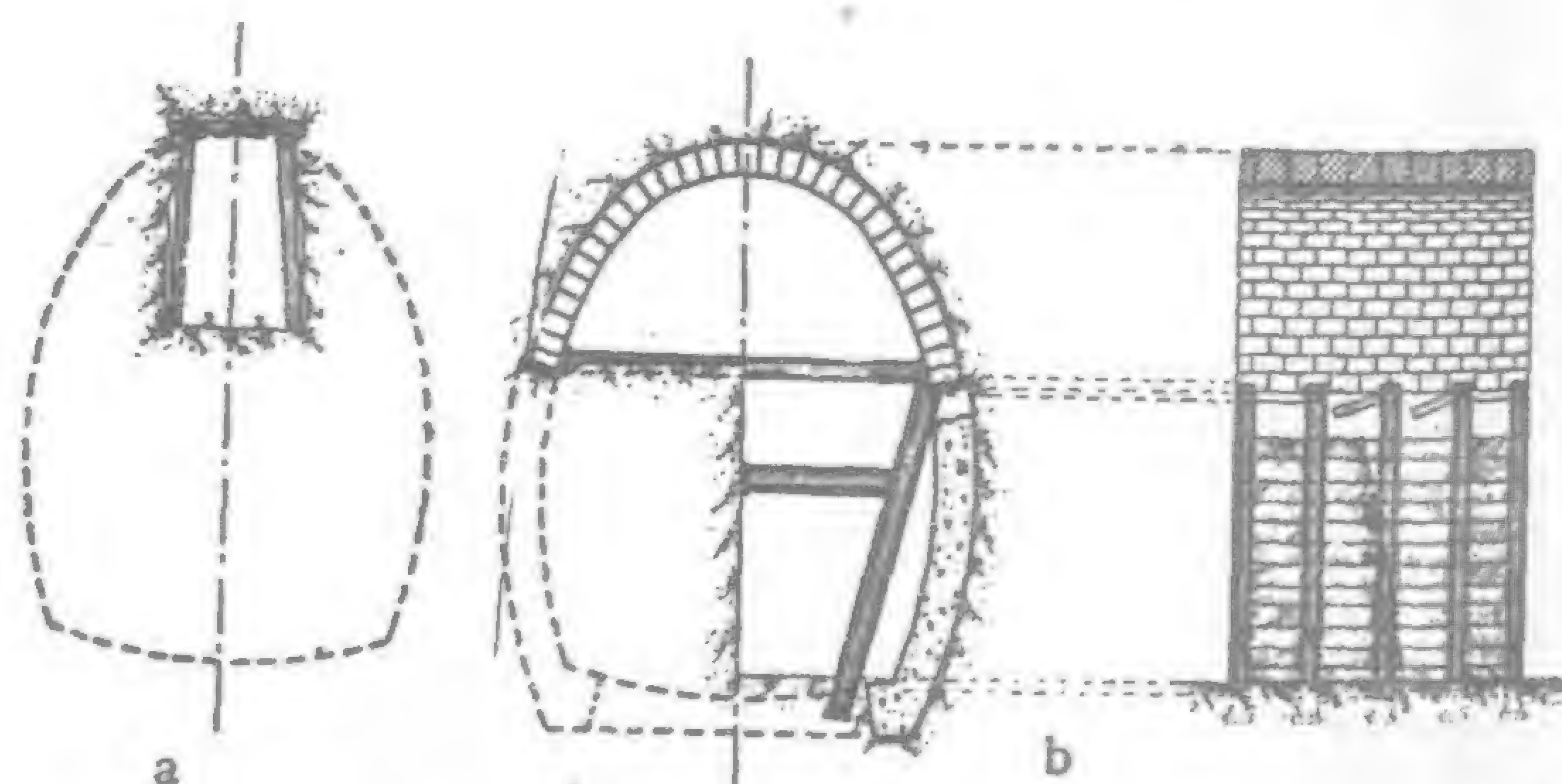


Fig. 11.

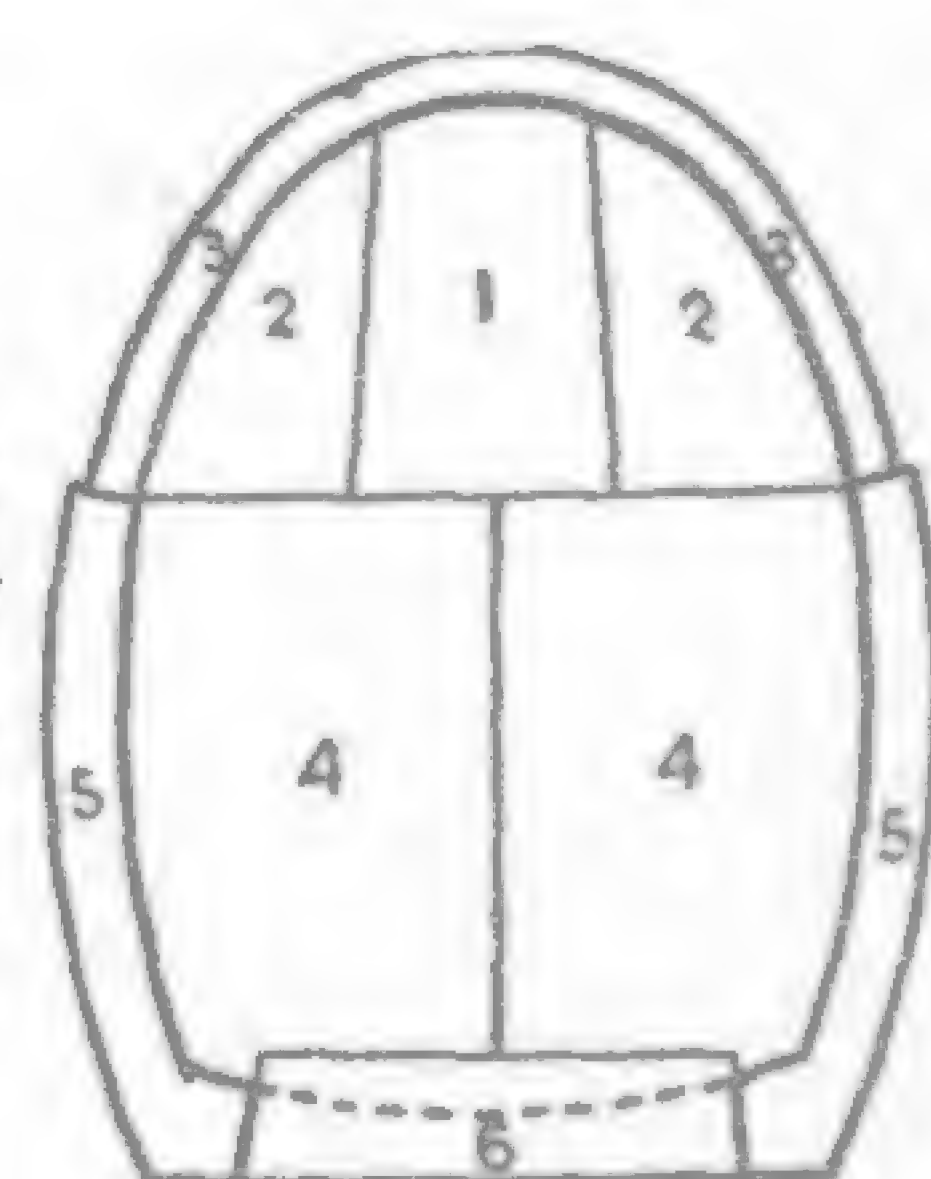


Fig. 10.

Being close to the Yellow River, the line needed protection work along it, and this was done at various points, particularly along the first several kilometers near the series of tunnels. Wooden piles were driven in the direction perpendicular to the direction of the current at frequent intervals and were woven with bamboo strips surrounded by heavy pieces of stone. After the first flood season, the above work seemed to be quite effective and similar work will be done at other points.

The nature of the soil along this section shows considerable variation in the degree of consistency, and therefore different slopes are adopted for earth cutting, varying from vertical cuts to about one to one slope. This region is in general very windy, carrying usually a large quantity of sand, making it rather difficult to keep the permanent way in clean condition.

The rail section used for this section of the line is Chinese Government Standard 43 kg. rail of 12 meters in length. 50,000 pieces of steel sleepers were purchased in Belgium, the remaining 90,000 required in this section are of Oregon pine and oak, chosen because of a lower first cost. Steel sleepers are used as much as possible in tunnels and on curves and heavy grade. 17 sleepers, steel or wooden, are used under a pair of rails. Track laying is now being done mostly by man power, due to lack of engines and frequent interruptions at the bridge sites. A great handicap is being experienced in transporting track materials by small flat cars over light rails, especially in climbing over high embankments and then going over deep valleys. The speed of track laying is only about 500 meters a day and 800 meters in a day and night. On August 4, 1931, the track reached Wenhsiang, an important intermediate point, 29 km. from Lingpao and 43 km. from Tungkwan. The railway has begun selling tickets to those who are willing to make a short ride on the construction train in coming back from Wenhsiang to Lingpao.

The longest bridge of this section is the Lingpao bridge having 12 spans of 30 m. each. Most of the bridges in this section are of deck plate girder type, and their design is apparently to suit the local conditions and available equipment for erection. All the bridges are good for Cooper's E-50 loading and their design and construction according to the Chinese Government Standards. Foundations of these bridges are all on wooden piles. On account of the topography, bridge piers are usually very tall, some of them being as high as 15 meters.

The track reached Tungkwan in December, 1931. Pending the completion of the Tungkwan tunnel, there will be a temporary station located near the East Gate of the city outside of the east portal of the tunnel to enable temporary handling of passengers and freight. The Tungkwan station will be outside of the West Gate, and will be ready for traffic in 1932, upon completion of the Tungkwan tunnel.

Tungkwan Tunnel

The city of Tungkwan, as seen in Fig. 3 and Fig. 4 is located along the south side of the Yellow River. The southern half of the city is built on mountains and only the north-western part is flat and inhabited. The city within the walls is of an odd shape having about 2½ km. in length and 1 km. in width. The city was formerly a point of military importance, and, on account of its situation, is still a commercial center in that territory.

Here the Yellow River takes a great turn after meeting the Wei River, and changes its course from southward to eastward. Consequently, Tungkwan is the point of attack of the changing current. The railroad line approaching the city from the east is already difficult, necessitating a tunnel of 909.10 meters just before reaching the temporary station outside of the East Gate. It was first projected to run the line around the city along the river outside of the city wall. (Fig. 4) This line will give the least disturbance to the city which is already small in area. But it was later found that this first projected line located some years ago when the line was some distance from the river, was already immersed in water in certain portions very close to the city wall, which, however, was strongly built to protect the city. Consequently its adoption was deemed impracticable, and a tunnel under a part of the city and through the other part was decided upon. This line offers a certain disturbance to the city, but only the less dense area will be affected.

The tunnel finally located, has its eastern portal just outside of the city wall near the East Gate, and its western portal in the middle of the city. The alignment has two reversed curves of 1,400 m. and 1,500 m. radius respectively. The alignment was chosen for the convenience of the two portals. The tunnel has a length of 1,080 meters and goes up from the east on uniform grade of 0.005 m. per meter as shown in Fig. 5.

The standard section of the tunnel, like other tunnels along the line, is shown in Fig. 6 for earth of good consistency, and in Fig. 7 for earth consistency of lesser degrees to be decided by the engineer in charge in accordance with the conditions. The thickness of the tunnel lining in the former case is 0.38 m, and in the latter, 0.51, 0.63 and 0.77 m. The areas of earthwork and lining are shown as follows:

<i>Thickness of Lining</i>	<i>Amount Earthwork</i>	<i>Amount Lining</i>
0.38 m	35.062 m ²	6.796 m ²
0.51	37.370	9.104
0.63	39.547	10.281
0.77	43.222	14.956

Fig. 8 shows the longitudinal section of the tunnel and Fig. 9 a typical front view of the portal.

The tunnel arch will be lined inside with concrete either placed in forms or in the form of precast blocks. During the winter months, when outside casting is impracticable, mixing inside the tunnel and mixture placed in forms will be used. The mixture is composed of 2 cu.m. of broken stone, 1 cu.m. of sand and two barrels of cement resulting in 2 cu.m. of concrete. The cement mortar for concrete blocks is made of 1 cu.m. of clean sand with two barrels of cement.

The Lunghai Railway has been adopting the Belgian system of driving tunnels and the local contractors are quite accustomed to this kind of work. As the tunnel will pass through loess formation of rather a uniform nature with no likelihood of encountering hard strata nor water accumulation, the driving will entirely be done by hand work with small dump cars pushed on light rails for the removal of the earth. Fig. 10 shows the order of operation where the head gallery No. 1 will be driven first, then 2, 2, and then the lining of arch 3; and when 4, 4, is removed, wall linings 5, 5, will be followed and then the bottom 6. While head gallery 1 is small in size, its practical depth on a tangent, where there is no artificial means of ventilation, is limited to about 300 meters, above which the work will become very uncomfortable. Fig. 11, a, b. and c. show the various stages during progress of the work.

Fig. 12 shows the alignment of the tunnel with side gallery CF and vertical shafts at D and E. These shafts D and E are used and so located primarily for ventilation during construction, and are not designed for removal of earth. Shaft E may be filled up later after tunnel is completed, leaving only shaft D for ventilation when tunnel is opened for traffic. The side gallery CF is designed for removal of earth and dumping of same on the bank of the Yellow River, as there is no room for depositing a large quantity of earth from the tunnel near the eastern portal.

The average speed of a working day of a good contractor obtained from previous driving records is about two meters deep for ventilating shafts, eight meters for head gallery and side gallery, four meters for arch lining, six meters for side wall lining and 16 meters for bottom lining. All these refer to hand driving with small wagons for the removal of earth without machinery being resorted to. The work of this tunnel is not likely to encounter many unforeseen difficulties, and is not likely to be delayed due to unfavorable weather conditions. Work was started August 1, 1931, and with the above speed, the entire tunnel can be completed in nine months.

Cost of Construction

Before calling for bids, various items of work were first estimated in quantity and unit price, and the bidders were requested to submit their unit values for comparison. The estimated quantities are by no means exact, but close enough for estimation and comparison. The construction of the tunnel was bid upon together with other works in the city of Tungkwan, the tunnel alone being about 60 per cent of the total. The following table shows the

itemized work and unit price of the successful bidder for the tunnel:

Item of Work	Quantity estimated	Unit cost	Total cost
1. Cutting in loess mingled or not with stone and where pickaxes or explosives are not needed. Price including excavation, timbering, airing, lighting, draining and hauling to outside of tunnel, and afterwards to a maximum distance of 100 m. from the tunnel, either in baskets or tip wagons or wheelbarrows with dumping on spots assigned by the Administration.	43,500 m ³	\$1.90	\$82,650
2. Driving air shaft where pickaxes or explosives are not needed. Price including excavation, timbering, removal and laying of earth near the shaft:			
(a) One shaft with estimated depth of 75 m.	300 m ³	4.50	1,350
(b) One shaft with estimated depth of 60 m.	240 m ³	3.50	840
3. Concrete blocks with concrete D and mortar D for lining of arches including timber centering, etc. ...	3,350 m ³	18.80	62,980
4. Concrete D put in place and rammed	7,580 m ³	13.20	100,056
5. Add price block lining inside tunnel	10,930 m ³	1.30	14,209
6. Concrete C for tunnel portals ...	300 m ³	11.40	3,420
7. Wooden forms for concrete with curved surface including all necessary supplies	8,800 m ³	1.80	15,840
8. Add. price for transportation of sand and gravel for lining beyond first 1,000 m:			
(a) For broken stone and gravel. Additional haul estimated within 1,000 m.	11,230 m ³	0.60	6,738
(b) For sand, Additional haul within 1,000 m.	5,615 m ³	0.60	3,369
			<u>\$292,452</u>

From the above table, it will be found that the total cost is \$292,452, to which 10 per cent is added for extra work, making a total of about \$322,000. For a tunnel of 1,080 meters, this would mean an average cost of \$298 per meter. The available figures for the average cost of other tunnels in this section completed within the last two years are as follows:

No.	Length	Total cost	Average per meter
1.	90.50 m.	\$ 26,955.56	\$297.85
2.	621.20	163,684.56	263.50
3.	90.30	33,320.16	369.00
4.	107.40	37,943.66	353.30
5.	622.60	181,997.38	292.31
6.	395.00	95,320.15	241.31

The Lunghai Railway has a contract with the Chi Hsin Cement Co. for the supply of cement to be delivered at Tangshan at a cost of \$23.20 per ton of six barrels. At the present time, the railway furnishes the cement to the building contractor at Shanchow store and charges the contractor at a cost of \$31.00 per ton according to the number of barrels actually put into work checked by the railway engineer in charge.

Tungkwan-Sianfu Section

With the Lingpao-Tungkwan Section completed the Ministry of Railways urges the line to be further extended to Sianfu. According to the resolutions adopted by the Central Government, this section is to be constructed out of the proceeds of the Russian In-

demnity Fund. As this fund has not yet been realized, the Ministry of Railways is making certain appropriations in order to start the work as soon as possible. This section along the south of the Wei River to as far as Sianfu, a distance of 130 km., goes over much easier country than the previous section and passes through numerous fascinating points of historical interest. Earth work for the first 24 km. was started July 1, 1931. If funds are available in accordance with the needs, this section may be finished in 18 months.

Tokyo Plans Huge Reservoir

As a measure to free Tokyo permanently from difficulties arising through the lack of a sufficient water supply during the summer months, the construction of a vast reservoir in Nish-Tama Gun, on the outskirts of the city, at a cost of Y.39,000,000, has been approved by a special committee of the municipality in charge of waterworks, and construction is scheduled to commence in the early part of October.

The proposed artificial lake, will have a total capacity of 6,600,000,000 cubic feet of water, which is approximately 13 times greater than the reservoir at Murayama, which at present is the largest water supply the capital has.

At present the City of Tokyo is supplied with water from two main sources, one the Murayama reservoir and the other the one at Yamaguchi, which, although actually being used, has not yet been fully completed. These two reservoirs, the waterworks committee points out, would not be enough for the needs of the city, at the present rate of expansion, by 1935, when a serious shortage of water would be felt unless something were done. When the proposed reservoir is completed and is put in use the authorities estimate that the total supply of water for the city will be brought up to 1,320,000 cubic feet a day, which will be more than ample even if in the meantime the population of Greater Tokyo has reached the 5,500,000 mark, as compared with the present population of about 5,000,000. In fact, it is said that with the new reservoir Tokyo is not likely to suffer from any serious shortage of water at least till 1955.

Due to its enormous size, the construction area of the new reservoir now includes a number of small villages, which as construction work is pushed will be demolished and taken away. Such places include the Okawachi Village, in Nish-Tama, the Kosuge Village, and the Takayama Village, both in Yamanashi Prefecture. In one part nearer the Tama River a huge dam with a depth of 134 meters will be dug, which will necessitate the removal of entire Okawachi Village.

Municipal authorities, also have decided upon the construction of a filtering station on a large scale near the present Murayama reservoir, while additional plans are being considered for the establishment of a big hydro-electric plant utilizing the dam of the proposed lake.

Yokohama, the city which until last year had been almost annually suffering from a shortage of water every hot season, due to increasing consumption, now has been entirely freed from this fear with the completion recently of a new filtering station capable of holding 750,000 koku (a koku is about four gallons) of water at Nishiya. The site of the station is to the west of the port city about two miles' distance from the railway station at Hodogaya.

The main feature of the Nishiya water plant is the water filtration equipment, which consists of four gigantic filtering pumps, each with a daily capacity of 260,000 koku, which amounts to about five and a half gallons of water for each citizen, and exactly double the quantity per capita until last year. The present works is the third extension enterprise in Yokohama since the establishment of the city's first reservoir in 1885, and also marks the completion of the first stage of a public works construction programme, the second stage of which provides the laying of 1,100 millimeter water mains in the district of Tsurumi, and is expected to be completed by the end of the year.

With the putting into effect of the Nishiya plant it is thought that the up-town parts of Yokohama, including Bluff, Negihi and Sagiya, where the supply of water has always been poor on account of weak pressure, will experience no more difficulty in obtaining water.—*Japan Advertiser*.



Crowds watch water from the Yellow River enter Main Canal of Saratsi Irrigation Project in Suiyuan, Dedication Day, June 22, 1931

Famine Prevention and Relief Projects

Engineering Accomplishments of the International Famine Relief Commission are Set Forth in Report of Chief Engineer, Mr. O. J. Todd

IN a foreword to his report on work achieved, the Chief Engineer of the International Famine Relief Commission says that the past two years have been active and fruitful ones for the engineers of the Commission and that through this period, dating back to the early summer of 1928, the Commission has done outstanding work in which two large irrigation projects stand out as landmarks—the Saratsi and the Wei Pei.

The very severe famine conditions in the north-western provinces two and three years ago, says Mr. Todd, presented a challenge to the Commission which others refused to accept due to the many local difficulties connected with constant political changes in governmental control in much of this territory. It was possible for the Commission to accept the unusual tasks and its engineers feel a just gratification in having successfully carried out a creditable

program of road-building as well as the construction of major irrigation projects. The most notable achievements have been in Suiyuan, Shensi and Kansu; though other work has been done by the Commission's engineers in Chahar, Jehol, Hopei, Shansi, Shantung, Honan, Kiangsi and Yunnan.

While the 1929 famine, due to extreme drought in North-west China, caused the Commission to increase its activities in that region, in order to give employment to the destitute population, most of the engineering projects decided upon were of a famine prevention nature. The need for properly constructed canal systems in Shensi and Suiyuan, and of more wells in Hopei and Shantung, was recognized as a means of insuring the food supply. Also the need for properly graded and drained roads for the use of motor and ricscha traffic was generally felt, in order to facilitate



Head gates at Intake on the Saratsi Irrigation Project where Yellow River water is brought in for Irrigating an Area of 250,000 Acres of Suiyuan Plains



Thousands of farmers and soldiers worked in water to complete Main Canal of Saratsi Irrigation Project by Dedication Day, June, 1931

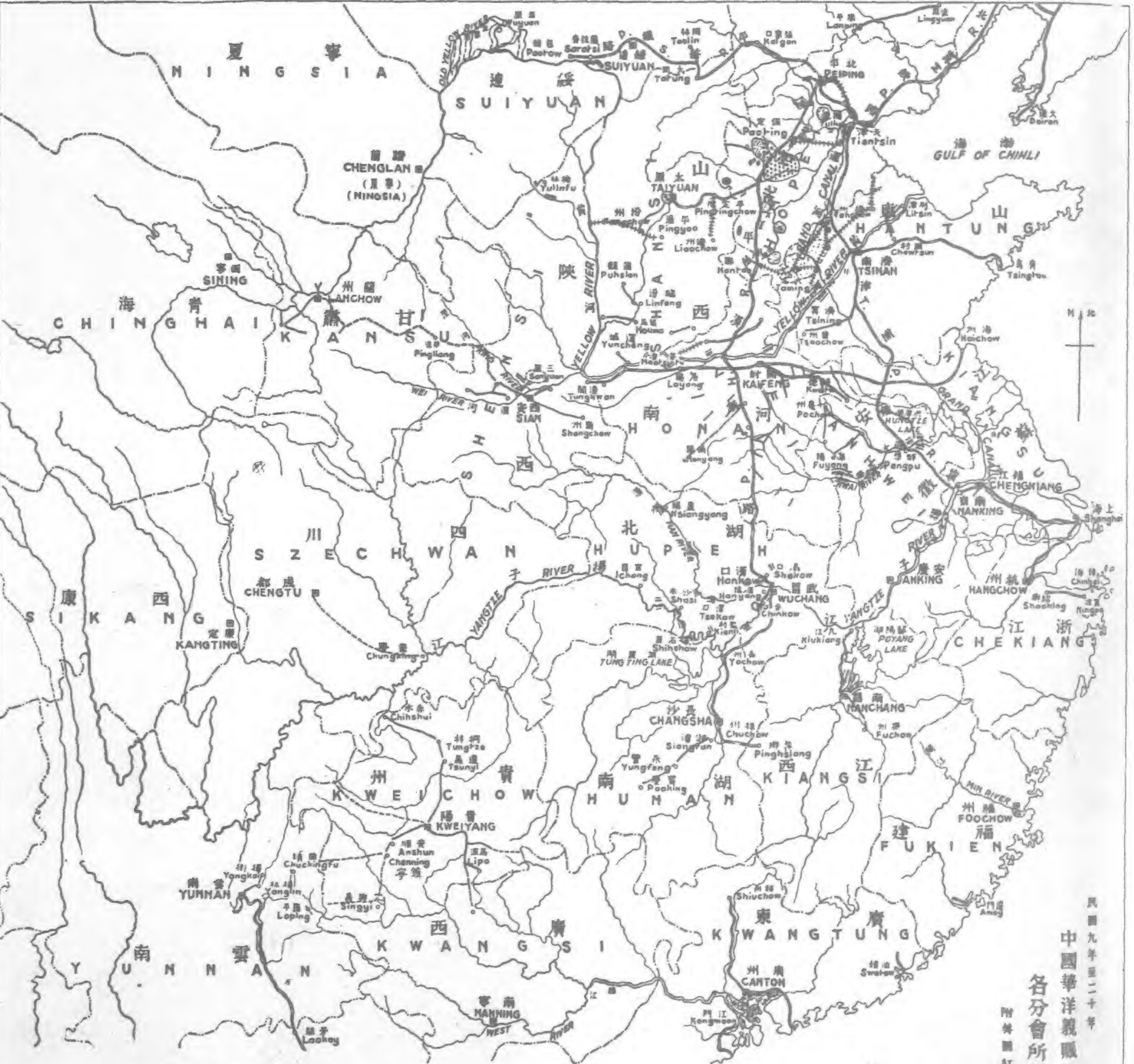
the movement of food and other commodities especially to places where famine had overtaken isolated regions. The building of utilities for the purpose of permanently preventing famines in back lying districts has been the chief aim of the Commission through the work of its engineers.

The accompanying general map of China shows all the previous work of this Commission dating back to 1920, and indicates what has been done during these past two years. Other maps are given to illustrate the brief paragraphs outlining the work by provinces.

As heretofore, the photographs used for illustrating are from many hundreds taken by Mr. Todd while in the field in connection with this work. The full report continues as follows:

Suiyuan

This province has large areas of land that might be used for colonization, if there was sufficient rainfall. But with a precipitation averaging only 12 inches per annum during the last ten years



REFERENCE 圖例

WORK BEFORE 1931 民國二十年以前之工程

- Roads 道路
- Dikes 堤防
- Bridges 橋樑
- Wells 水井
- Reservoirs 水池
- Trees 樹木
- Irrigation Canals 灌溉水渠
- City walls 城牆
- Riverbank Protection and Seawalls 堤防海墻
- Surveys and Investigations 測量及工程計劃

WORK DURING 1930-31 民國十九年及二十年之工程

- Irrigation Canals 灌溉水渠
- Wells 水井
- Dikes 堤防
- Surveys and Investigations 測量及工程計劃
- Roads 道路

WORK BY AMERICAN RED CROSS, 1920-1921

民國十九年美國紅十字會所辦之工程

- Roads 道路
- Wells 水井

FAMINE PREVENTION AND RELIEF PROJECTS

Undertaken By

CHINA INTERNATIONAL FAMINE RELIEF COMMISSION

And

CONSTITUENT COMMITTEES

1920-1931

(Including Roads and Wells built by American Red Cross, 1920-1921)

Scale 尺例比 100 200 300 400 500 Km.

Oct. 1931

Chief Engineer D.J. Todd

民國九年至二十年

中國華洋義賑救災總會及

各分會所辦之工程成績總圖

附美國紅十字會所辦鐵路及捐井工程

二十年十月編繪

farming is hazardous, and in consequence each land holder must have broad fields for grazing. In 1928 the rainfall near Saratsi was less than seven inches. A very serious famine overtook the region and large areas were almost entirely deserted.

To meet this emergency the Saratsi Irrigation Project was undertaken by the Commission in June, 1929, after the engineers had made surveys and it seemed a practical piece of famine prevention work.

The area to be served by this project lies immediately to the east and south of Tengkow Station on the Peiping-Suiyuan Railway where the Intake from the Yellow River is located. The main

canal runs almost directly east for 42 miles. The land slopes gradually to the south toward the Yellow River. Fourteen lateral canals spaced three miles apart, with a total length of 145 miles, will carry water from the main canal over this area of more than 250,000 acres.

The population of 50,000 half starved farmers who have been living in this area may be replaced by a prosperous community of half a million when water is put onto the land, as a result of this new project which was dedicated last June and needs but a few weeks of additional work to put it into service. In the coming spring, the first nine of the fourteen laterals should be ready for use.



Shansi soldiers contributed toward the success of the Saratsi Irrigation Project in Suiyuan.



Digging a Lateral Canal by Shansi soldiers on Saratsi Project



A Lateral Head Gate with Bridge for Carts and Motor-cars on Saratsi Irrigation Project



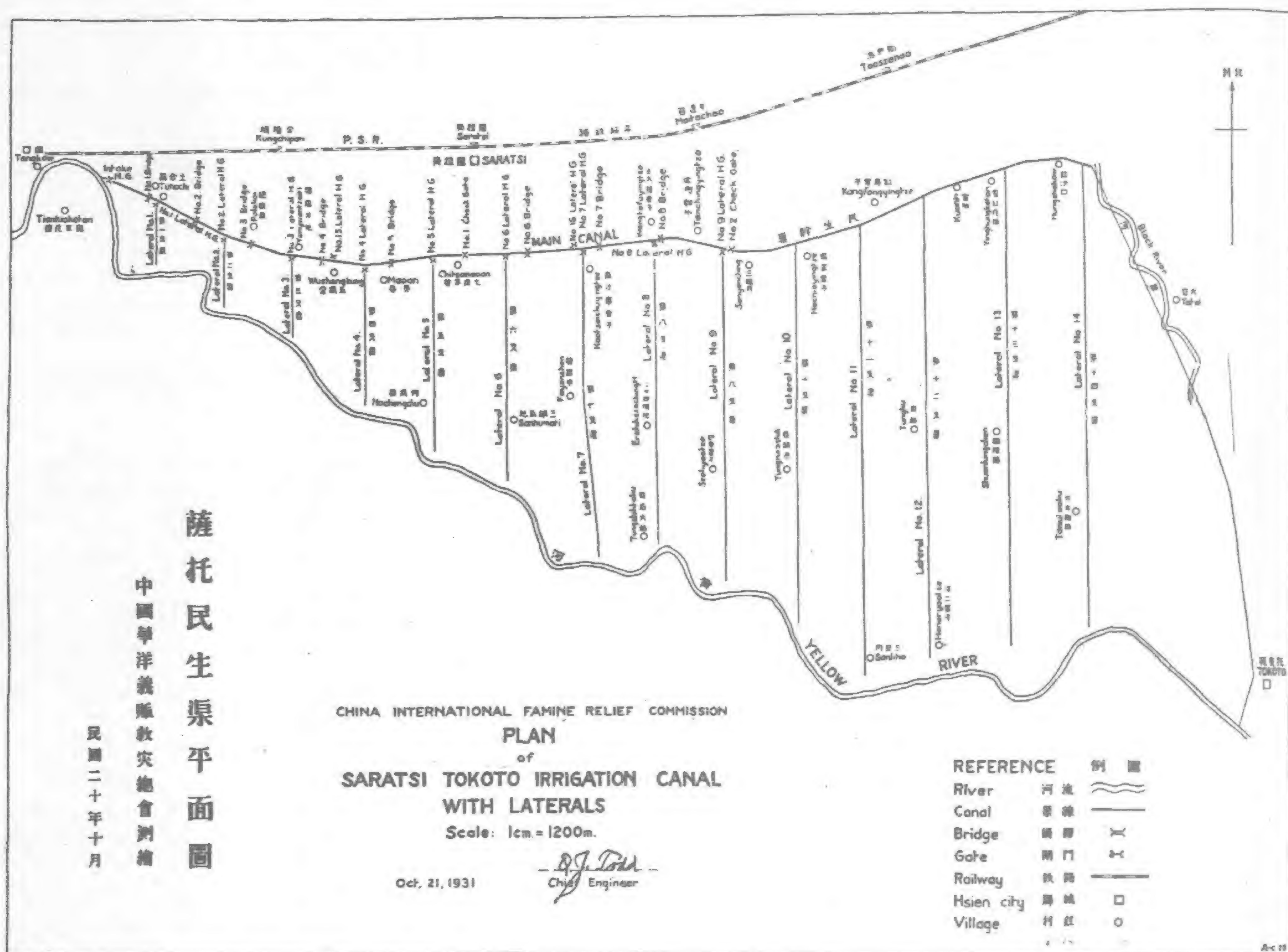
Check Gate at Chi Tso Mao An on Main Canal 16 miles from Intake of Saratsi Irrigation Project



River protection work along the Yellow River at Intake of Saratsi Irrigation Project



At busy construction season a train of 70 camels leaves Saratsi Headquarters of Commission with grain or cement for work on the Canals



The special structures now completed for the first stage of this development include all necessary head works, two check gates across the main canal, eleven lateral head gates and bridges combined, and eight wooden bridges. The head gate at Intake and the two check gates each carry a concrete bridge. Stone bunding of a most substantial nature protects the Intake, so that the Yellow River can not wander from its course at this point. The submerged weir for raising the low water in the river will be a part of the second stage of development.

This project has cost approximately \$750,000.00, of which \$300,000.00 was supplied by the Suiyuan Government and the remainder by the Commission which entered into an agreement with the Suiyuan authorities whereby it would receive back its portion of the cost as water rates are collected, so that this fund may again be used elsewhere in a similar manner. The Commission has had complete charge of this work and has been given co-operation in many ways. The Government assisted by granting free railway passes the first two years to all the Commission's staff while on this work, and by waiving in the first year all freight charges from Peiping to Suiyuan. Since then half rates only have been charged. This has meant distinct contribution to the cost of the project. Also during the past year, certain military units were assigned to this project. 3,600 soldiers worked at canal excavation for several weeks at the usual very nominal rate of pay.

This irrigation project compares favorably in size with many of the larger reclamation projects of the United States. Its main

canal at Intake has a width of 60 feet on the bed, 90 feet at ground surface, and is 10 feet in depth. Its maximum flow in high water season is little short of 2,000 cubic feet per second. Berms of 20 feet in width are left for future expansion, so that increased capacity may be obtained. The lateral canals are ten feet wide at bottom with top width 40 feet where depth is 10 feet. The sub-laterals must be constructed by the individual farmers using water or by groups of farmers wishing to use such sub-laterals together.

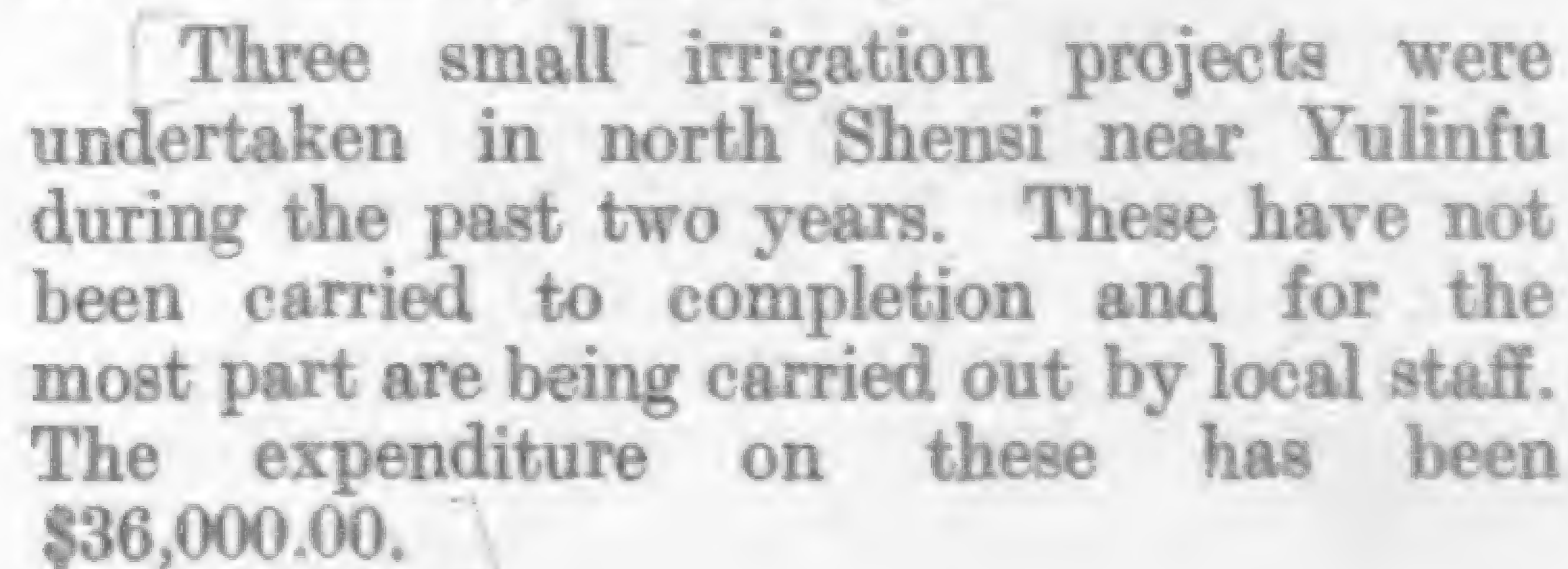
This irrigation system provides far more water than the present population can use and gives immediate facilities for colonizing. It insures this part of Suiyuan from famine such as came in 1928-29. Though 30 per cent of the people either died or migrated at that time and hundreds of villages were deserted, there will be a resettlement of this area under these conditions of water supply.

Shensi

The drought famine of 1928-30 struck Shensi as severely as it did Suiyuan. As soon as adequate funds were at hand, a construction program was launched in the spring of 1930 for the extension of the very limited highway system then existing near Sian. Though civil war and banditry had made the commencement of this work difficult, by July the work had been so organized that it received the full support of both civil and military officials in that locality. Thousands of famine refugees were put to work. Old roads were repaired and new ones built to facilitate motor traffic and the use of rickshaws. In the vicinity of Sian, but chiefly to the west



"Dragon" or "Ladder" pumps were used to unwater wet stretches when excavating Main Canal on Saratsi Irrigation Project



Kansu

Kansu suffers from its isolated location in the North-west much as does Kweichow in the South-west. In both cases the nearest railway is more than 200 miles from the provincial border. Both provinces are hilly and remote. In time of drought, they suffer severely with little hope of succor from outside.

The drought famine of 1928-30 was particularly disastrous to Kansu. Typhus as well as starvation took a heavy toll. The province was too poor and in too much disorder, due to civil strife, to handle the situation alone. The C.I.F.R.C. was able to get a limited staff and funds to Lanchow both in the spring of 1929

and 1930 and proceeded to employ destitute farmers in building public utilities until autumn. In this the local officials co-operated with materials of construction, to assist in bridge building, etc., and powder for blasting rock.

The improvement and extension of roads was the outstanding result of this program. In these two seasons 700 miles of cart roads were widened or otherwise improved so that motor-cars could use most of them. In this connection a number of earth bridges, or deep fills, for which Kansu is famous, were constructed. The sum of \$500,000.00 was expended in wages, thus improving local communications. Refugee Chinese, Moslems, and Thibetans all joined in this work, there being as many as 20,000 engaged in it



Unwatering part of Dam Site on Wei Pei Irrigation Project May, 1931



Starting the Dam on the King River, Wei Pei Project October, 1931



Flood Aqueduct over Main Canal near Mu Shu Wan on Wei Pei Project, August, 1931



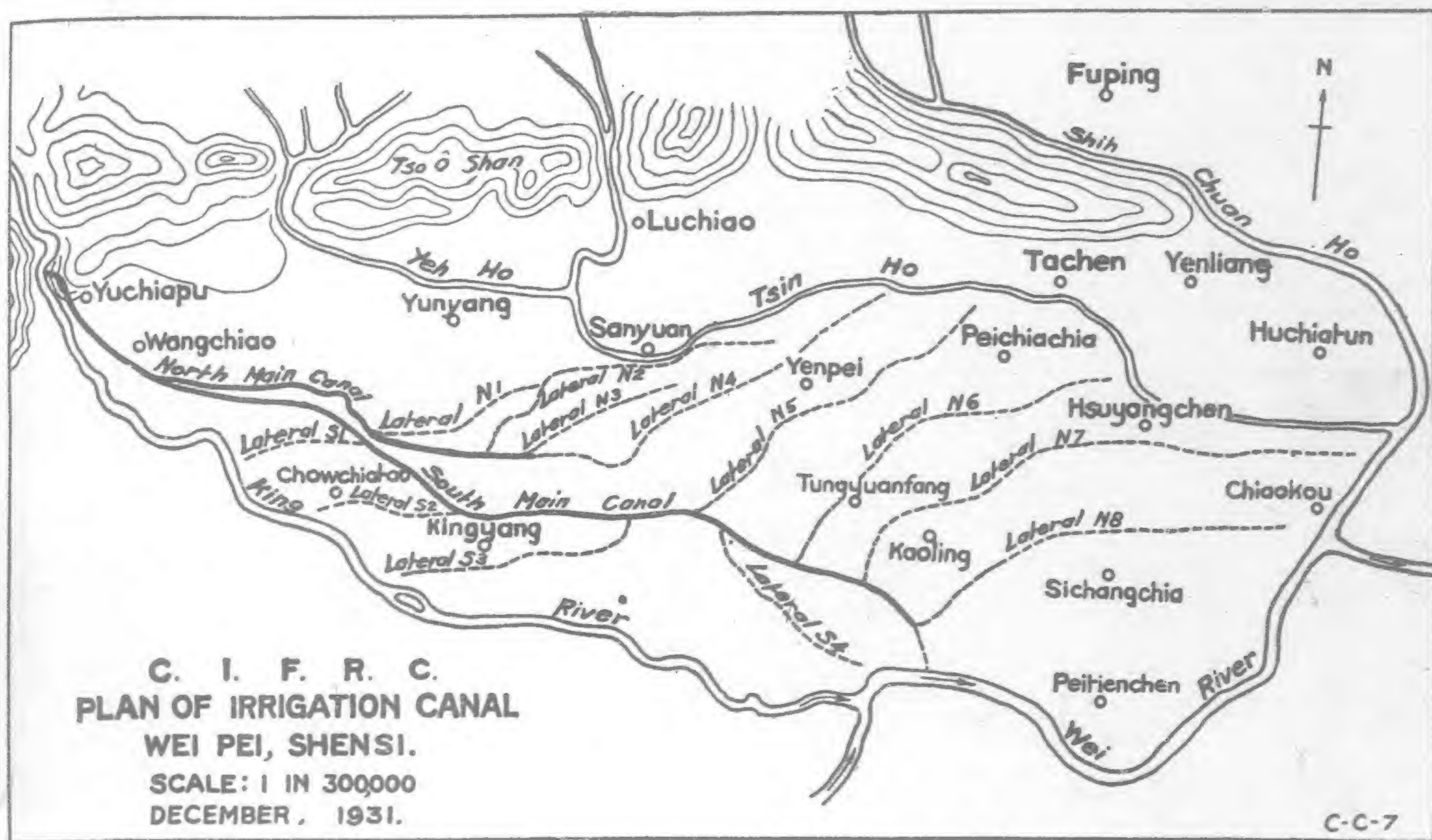
Bridge Built by Commission on New Motor Road connecting Sienyang with Wei Pei Project



In Summer Ferry Boats move Motor-cars, Mule Carts and Wheelbarrows across Wei Ho at Sienyang, Shansi. The Commission used this crossing between Sianfu and Wei Pei Project



Banditry, Revolution and Drouth have driven from the land families whose ancestors are buried here. Wei Pei Irrigation District, Shensi



during July and August, 1930. Most of the 1929 and 1930 road construction was in the Lanchow region south of the Yellow River and to the south-west and east of the capital.

During these two years the sum of \$55,000.00 was spent on wages in improving river dikes, digging irrigation ditches and developing springs and small reservoirs for improving the water supply of a number of villages.

With conditions of poverty still bad in this province, a new road program was begun in the spring of 1931. The sum of \$350,000.00 was set aside as a gift from China Famine Relief Inc. of New York City to help make a well graded motor road from Sian to Lanchow. Most of this fund is to be spent within the Province of Kansu. Shensi provincial funds are pledged to assist in improving the present road within that province. Surveys by the Commission's engineers commenced in May, 1931, near Ping Liang and

now two groups of engineers are constructing this road. There are seven bad hills on the route and the present program is to reduce all grades to 7 per cent or less. The old cart road now used has grades up to 33 per cent, while 25 per cent grades are often found on these hills. Such means of communication have so thoroughly isolated Kansu that commerce with the coastal provinces is very limited.

With the completion of a well graded road, the entire 450 miles between Sian and Lanchow, autos, rickshas and bicycles will handle most of the passenger traffic and much freight at a less cost and much greater speed than by the old system of pack animals and carts. It will require another year and more funds to complete this undertaking but it will go a long way toward preventing such famines as have harassed this province these past few years.



Goat skins Inflated with air are Used in Standard Rafts for bringing cargo to market at Lanchowfu where Yellow River is rather rough



Building a Native Diversion Weir with willow baskets filled with small stones. Shih Lu Intake, near Peiping



King River Canyon, showing Dam Site for Wei Pei Irrigation Project, Central Shensi



Handling deep excavation on Wei Pei Project by use of tripod, pulley, rope and basket plus man power

Chahar

Some preliminary engineering investigations into reclamation programs were made early in 1930 by the Commission's Chief Engineer in the vicinity of Kalgan. The Yang River Irrigation Project, 30 miles west of Kalgan, was estimated to cost \$250,000.00 and be able to serve an area of 15,000 acres of good agricultural land. Political instability made it impossible to finance this work locally and the Commission had no new funds to apply to this section of the country. This is strictly famine prevention work.



Magistrate at Sienyang, Shensi, puts Temporary Bridge over Wei Ho each Winter for Carts and Motor-cars



Making a cut in loess soil to depth of 70 feet in Routing the King River water from Intake to the Plain on Wei Pei Project



Auto trucks find it difficult to get up grades of 30 per cent in the Loess Clay Hills of West Shensi. This is Chief Engineer's Party en route to Lanchowfu with Engineers for Relocating Silan Motor Road. August, 1931

At present no famine exists in that region, so that this and other worthy projects along the Yang Ho, including river training to protect farms and villages, must await future organization of public utility enterprises.

Jehol

Famine conditions, due to drought in sections of this province, were locally relieved in the summer of 1930 by a work program in which the Commission expended \$9,000.00 in rebuilding part of the motor road from Linyuan to Kung Cha Man and from Cha



On the Wei Pei Plain where Monuments to former wealthy Land Owners abound



Cross an "Earth Bridge" among the Loess Hills on Road from Sian to Lanchow, August 1931



An American Air Compressor brought in parts a distance of 180 miles from end of Railway to operate Jack-Hammer Drills in wet tunnel work at King River Canyon Wei Pei Project, Shensi



After mile climb up grades averaging 20 per cent foot passengers and wheelbarrow men stop to rest on Pinchow Hill, West Shensi, August 1931



Badly drained clay roads cut up by narrow tired carts make difficult motoring after heavy rains near Shensi-Kansu Border, Chief Engineer with Survey Party en route to Lanchowfu

Peng to Nan Kung, altogether 95 miles. Cart roads totalling 70 miles in length were also repaired in the same vicinity.

Hopei

After the drought famine of 1920-21 in North China work relief took the form of highway construction as a rule. When drought came again in 1928 irrigation by wells was considered the logical thing for the Commission to support. The sum of \$200,000.00 was expended in four southern counties of Hopei and six northern counties of Shantung for carrying out this program. Nearly 2,000 wells were thus dug on a loan basis, each well costing about \$100.00 and the loans being made for five years. Of these wells 811 were in Hopei. This work was done in late 1928 and early 1929.

Toward the end of 1929 the Commission's Chief Engineer was asked to act as Honorary Engineer Adviser to the Government of Hopei on irrigation matters and to commence an investigation of the water resources in this province. Field studies in this connection have gone forward in 1930 and 1931. The Governor of Hopei supplied \$5,000.00 personally to assist in these studies.

A careful study of the wells in Ting Hsien outside the villages showed that there were 40,000 being used by the farmers or one for every ten people in the country. These wells represent an investment of more than \$3,000,000.00, and the additional annual return in crops due to them equals the cost of these wells. Half of them have been dug in the last ten years. Nearly 60 per cent of this county is thus irrigated.

Other similar studies are being completed and the data compiled for Wuki and Shuntefu districts. In the latter county a great deal of irrigation is being done by ditches from springs and small streams. Recommendations based on these studies will be made in connection with a proposed provincial loan to farmers for improving their farms by a more thorough development of their surface and sub-surface water supply.

In October, 1931, preliminary investigations were made of the Tsu Ma Ho, west of Kao-peitien, as a source of water supply for irrigating a large tract of good farm land lying along the western edge of the Hopei plain. Here perhaps \$1,000,000.00 will be required to develop the proposed scheme and bring water to nearly 100,000 acres.



Yellow River in Rocky Gorge a few miles east of Lanchow, Kansu



Chief Engineer (in foreground) bargains with a carter for animals to help pull Auto Truck up steep hill near Shensi-Kansu Border



View looking east from top of Liu Pan Pass, Kansu, over which Silan Motor Road is to be built. This pass is over 9,000 feet above sea level

In the Ping Shan district west of Shihchia-chwang fifteen native canals exist representing an investment of more than \$1,000,000.00 during the past two centuries. Most of these projects are comparatively modern. The largest of these undertaken a few years ago failed, but, with the aid from our Commission of an additional \$20,000.00, it can be put into operation again furnishing water to 7,000 acres of land. It is hoped that the Commission will be able to find funds for this. Irrigation has made this district prosper so that land with water has advanced in sale value to \$1,000.00 per acre.

River improvement to the extent of \$10,000.00 was carried out in 1930 near Chochow. In the same summer some valuable dike repair work was done in the region of West Lake 20 miles east of Paotingfu. Here local co-operation was good. The Commission loaned to the local gentry \$13,000.00 which our engineers spent on these repairs.

Shansi

The greater needs in Shensi and Kansu kept the Commission to very limited expenditures in Shansi, though drought in 1928 and 1929 had caused heavy crop shortages in the wheat belt of the south-western counties. Here one piece of highway rebuilding and extension was carried out in late 1929 and 1930 with an expenditure of \$22,000.00. This was the Houma-Hotsin motor road 45 miles long and an eight mile extension to the Yellow River at Yumentu. Surveys and estimates of an aerial crossing at the latter point were made, but the Commission did not undertake this work. It was recommended to the provincial authorities as a part of their public utility program.

Irrigation in Shansi was assisted by the Commission in 1930 by aiding the Provincial Construction Bureau in its work of building a dam across the Fen Ho at Chingyan to divert water to nearby farm land. The Commission gave \$10,000.00 toward increasing the stability of this dam as per suggestions of the Commission's engineer. This dam was completed early in 1930 and functioned well throughout the year.

Shantung

As a means of doing some permanent work in Shantung, while giving labor relief after the 1928 drought, well digging was chosen

as an important part of the program. While good water was not found in all parts, 1,125 wells were built in satisfactory locations in northern Shantung in 1928-29. These were built for selected farmers on a five year loan basis as was done in south Hopei the same season. The cost was about \$100.00 each.

Two river training jobs along the Wei Ho and Grand Canal were completed in early 1929 at a cost of \$32,000.00 to protect the Lintsing region from flood in time of freshets. Former local government buildings were torn down by the officials to donate materials for work.

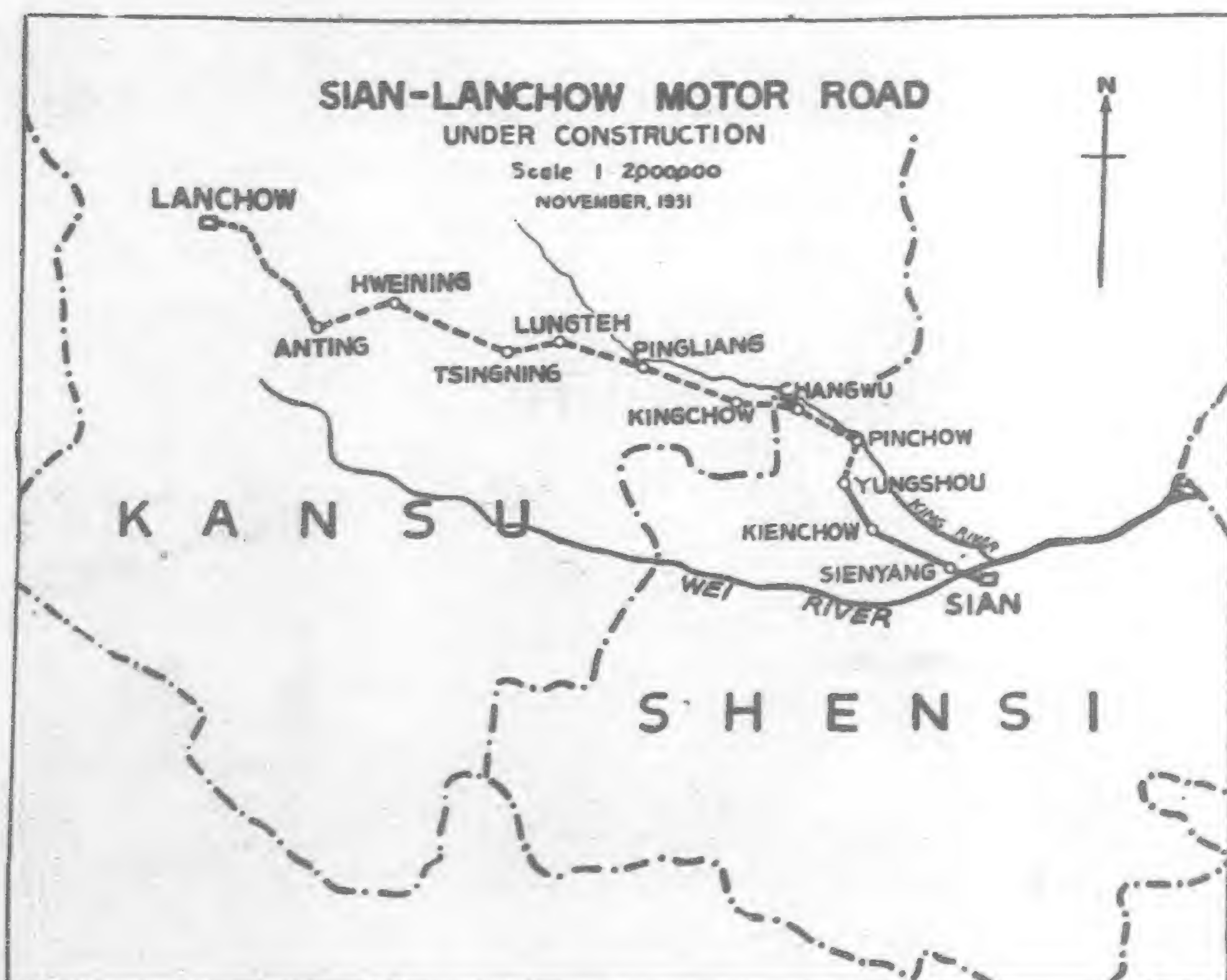
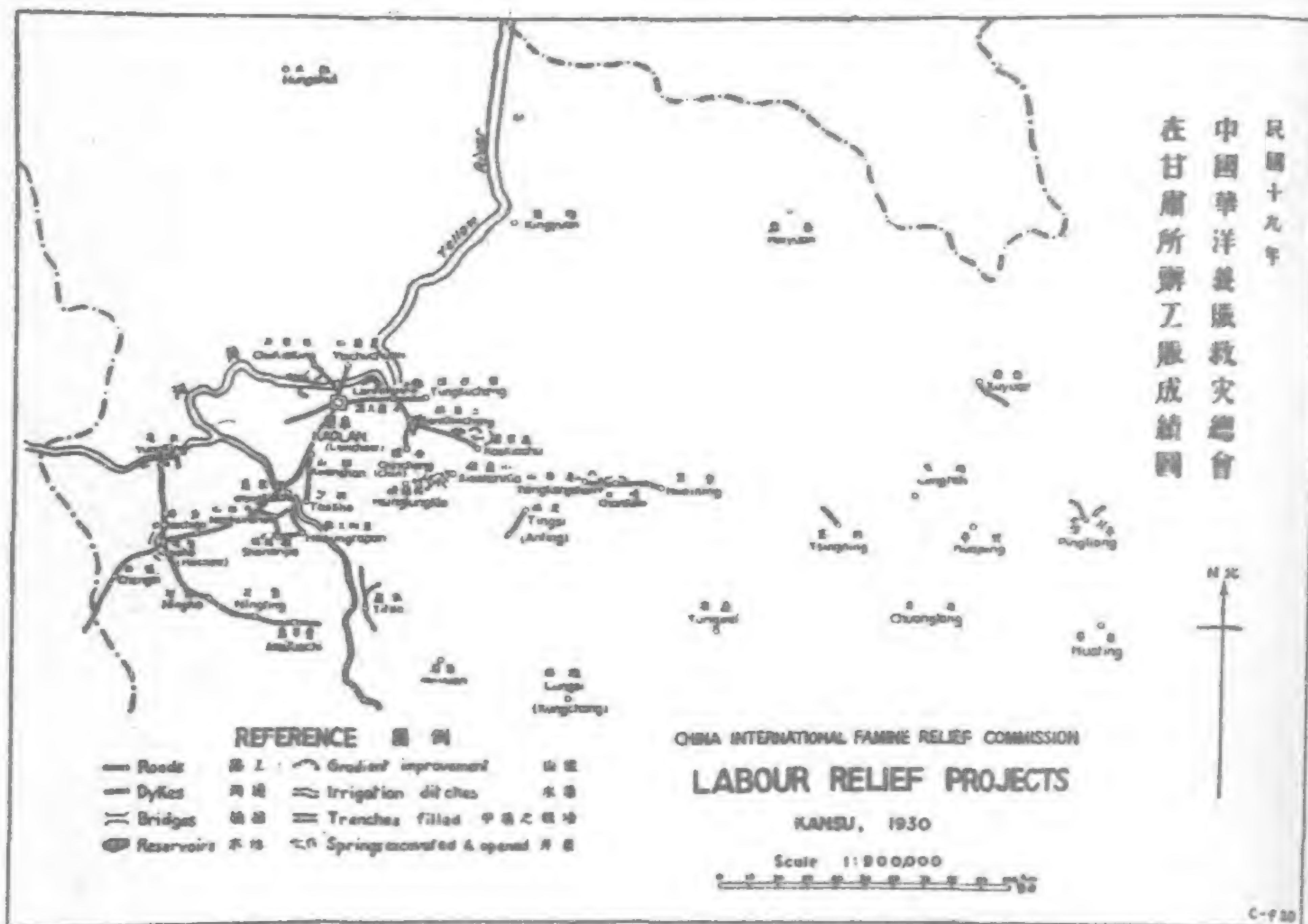
Road repair work was carried on in Ichow, Tungchangfu, and Chaochang as well as south of Nankuantao where connection was made to Tamingfu. The cost totalled \$45,000.00, nearly all of which was in wages. This considerably improved the situation for extending motor bus service.

Honan

Severe famine conditions in south-west Honan near Nanyang induced the Commission to undertake the building of a motor road from Hsuehang on the railway to Nanyang in early 1929. Our engineers made a careful survey of the route, 105 miles long, and commenced construction in April. Political changes and military movements stopped this work the following June and it was not practicable to resume our activities there. However, early in 1930 the Commission's Chief Engineer made estimates and prepared specifications for improving the main trunk road from Kaifeng to Hsuehang, a distance of 80 miles. Civil war prevented the completion of this work, though the money was appropriated through the Honan Commission of the China International Famine Relief Commission.

Kiangsi

Work of famine prevention in this province took the form of road building. The former plan to build a road from Nanchang to Fuchow was given up due to the inability of the provincial authorities to meet the cost of bridges and lands. The Kiangsi Committee of the China International Famine Relief Commission then undertook the metalling of ten miles of the Nanchang-Linton Provincial motor road. This was completed in early 1930 at a cost of \$75,000.00. The road was built by the Kiangsi Provincial Road Bureau, but the clay soil was so sticky in wet weather that no motor-car could



run after a light rain. The Commission raised, drained, and surfaced six to eight inches deep with river gravel a strip ten feet wide along the middle. As yet China has done very little in road surfacing. The costs seem to be too great for the provinces having clay soils and heavy rainfall.

In this work of road building or improvement satisfactory co-operation with the local authorities was arranged by our Commission.

Yunnan

Work in Yunnan in recent years has been of a famine preventive nature and on a limited scale. It has taken the form of motor

road extensions. In 1929 our Yunnan Committee co-operated with the Yunnan Government in making certain improvements to the famine relief motor road built in 1927 from Yunnanfu east 15 miles to Ta Pan Chow. The sum of \$34,000.00 was spent by our Committee just east of Yunnanfu on bridge and paving improvements in this connection. As the soil here is red clay, the work of macadamizing the entire length seems necessary. The extensive road plans formulated when the Chief Engineer visited this region in 1926 and again in 1927 have been shelved until happier days, for banditry and political changes are too common to make such programs feasible there at present.



Part of proposed Tsu Ma Ho Reservoir Site west of Kaopeitien, Hopei



Ice jams in Lower Yellow River, Eastern Shantung, caused Several breaches in Main Dike



Customary method of transporting grain in Honan along route of the Hsueh-Nanyang proposed Motor Road



Where the Nanchang-Linton Motor Road connects with branch to Fuchow, Kiangsi. The Kiangsi Committee of the Commission had a part in this road construction



Intake channel for the Shih-Lu Irrigation Project



Intake of the Shih-Lu Irrigation Project with native type of temporary diversion weir completed

Previous Reports

The Engineering Department of the China International Famine Relief Commission was organized late in 1923 for the purpose of uniting the engineering work that had formerly been done by provincial Committees. Reports on this work starting back with the famine of 1921 have been published in three previous issues of *Engineering Accomplishments* and in the annual reports of the Commission.

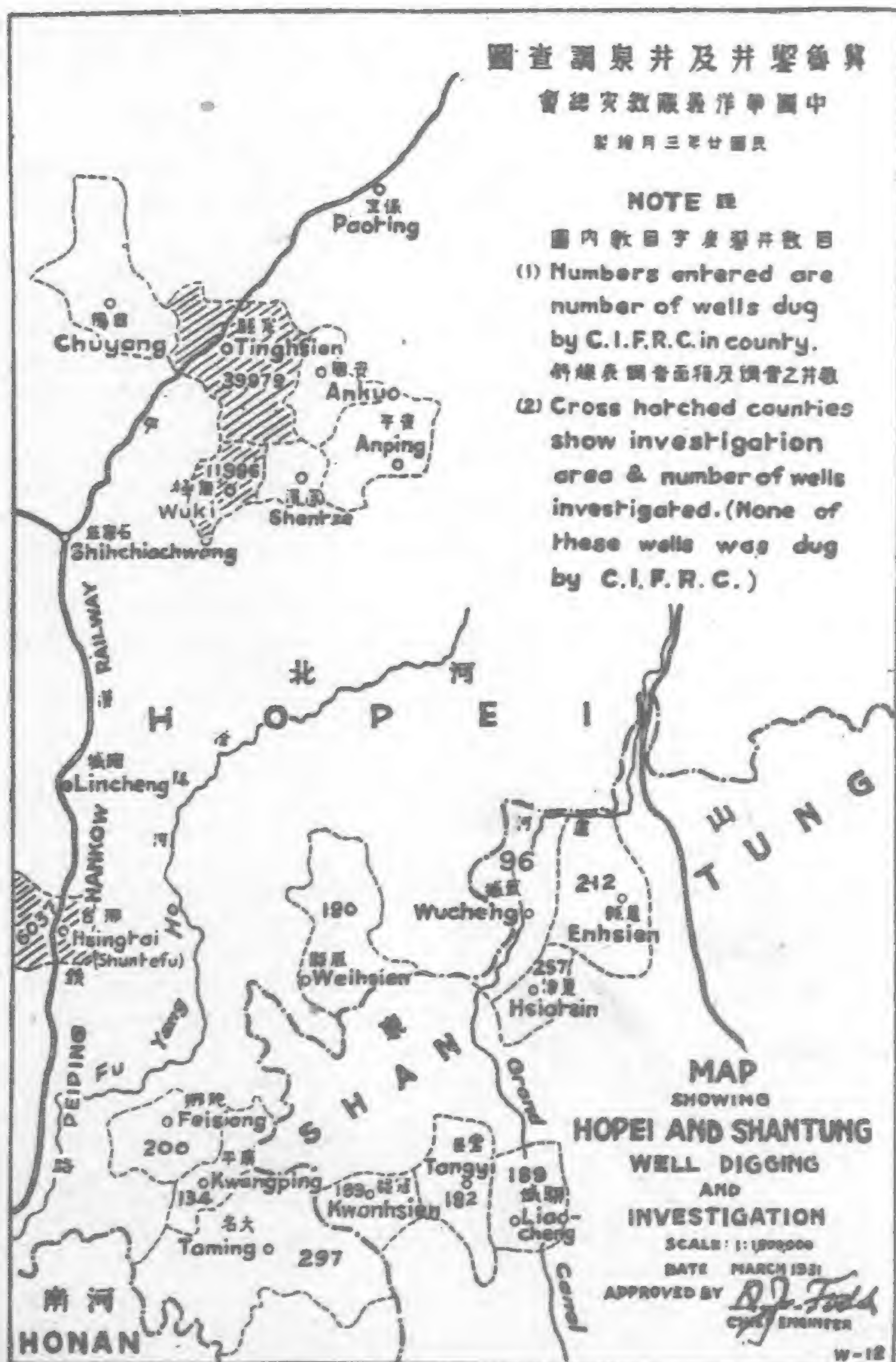
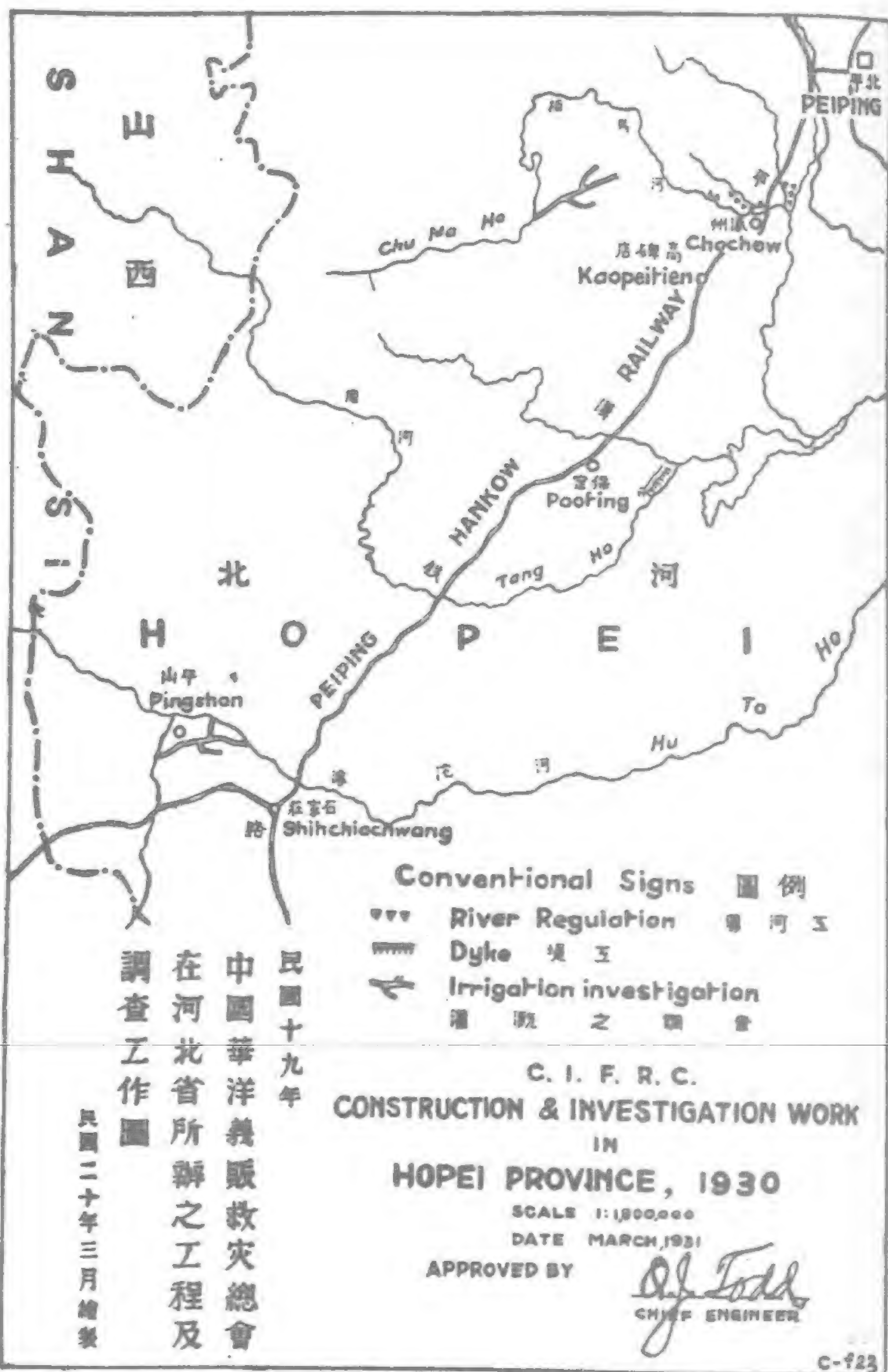
A short review will here be given of work done up to 1928 and previously reported in similar pamphlets.

THE YELLOW RIVER REVERSION NEAR LI TSIN

Not long after its formation the Commission played an important rôle co-operating in a large flood relief project near Li Tsin, Shantung, where the Yellow River had left its banks in the summer of 1921 desolating a vast area in the north-eastern corner of the province. Here the Commission contributed \$360,000, out of the \$1,500,000 required to complete the undertaking. Shantung Province raised over \$1,000,000 for this project and engaged foreign engineering skill to plan and execute this reversion work. Two hundred square miles of farm lands in three hsien (counties) were reclaimed, permitting 250,000 people to return to their homes. Upon the successful completion of this most notable piece of river training in recent years, the Chief Engineer who had laid out and handled the work was chosen to head the Commission's new Engineering Department.

SHANTUNG NEEDED MORE ASSISTANCE

In 1922 also two motor roads were constructed, one from Tsining to Tsaochow, a distance of 80 miles, at a cost of \$150,000.00



paid from funds donated by America, and another 45 miles long from Chowtsun to the Yellow River, costing \$60,000.00. These two roads have been in almost constant use for the last ten years with bus service over them and to points beyond.

While these were being built repairs to the inner dikes of the Yellow River went forward from a point near its mouth to the western border of the province, in ten hsien (counties), at a total cost of \$200,000.00. At the same time, extra culverts and other repairs were put into the Red Cross roads built north of the Yellow River the previous year. These improvements amounted to \$90,000.00. To the north-west of Tsinan and north of the Yellow River, another \$30,000.00 was spent that year on cleaning main drainage canals.

HONAN BUILDS ROADS, DIKES AND CANALS

During the first two years of the Commission's existence the Honan Committee improved or built new 700 miles of highways so that motor-cars might be generally used over the eastern part of the province. This led to further extension of the highway system by the local governments so that to-day most of the principal cities of eastern Honan are connected by auto service. This same Committee built six miles of new Yellow River dike at a cost of \$90,000.00, dug 13 miles of irrigation canal, cleaned the upper Hwei Chi River for 28 miles, etc. The sum of \$500,000.00 was thus spent in engineering improvements in that province. Since then road improvements have gone forward supported by various political leaders in Honan.

EARLY INVESTIGATION OF THE WEI PEI IRRIGATION PROJECT

Surveys of the Wei Pei Project were carried out by the Shensi Committee of the China International Famine Relief Commission

during 1923 and 1924. The Chief Engineer of the Commission visited this region and studied the project in 1924 recommending at that time the construction of this utility as soon as funds could be obtained.

HUPEH DIKE SYSTEM IMPROVED

In the early days of the Commission and through 1927 the Hupeh Committee interested itself in dike construction particularly along the Han and Yangtze Rivers as famine prevention work of great urgency. Altogether over twenty flood prevention projects were thus undertaken and completed by this Committee at a cost of something over \$1,600,000.00, approximately half of this being borne by the China International Famine Relief Commission. Two of the most notable pieces of work in this connection were the Shihshow dike at Temple Hill and improvements to the Chang Kung dike back of Hankow. (Increased crop values upwards of \$2,000,000.00 have annually been harvested in the lands back of the Shihshow dike since 1925). It is to be noted that neither of these dikes failed during the unprecedented floods of the past summer.

THE GOOD ROAD MOVEMENT IN SHANSI

Following up the famine of 1921 our Shansi Committee put \$190,000.00 into the construction of motor roads in that province. This, with the work of the American Red Cross in 1921, so encouraged road building that now motor busses are common between nearly all the large cities of Shansi. That province now has many hundreds of miles of good motor roads maintained by the provincial government.

HUNAN ALSO BUILDS ROADS

With a grant of \$500,000.00 from the American Advisory Board our Hunan Committee undertook the construction of the Siangtan-Paoking motor road 110 miles long. These funds were sufficient for about half of this road. The remainder of the work was later done by the Province so that auto service is regular in that region to-day. With this beginning, and a 30 mile road connecting Siangtan with Changsha, the province has entered onto a rather ambitious motor road program.

THE KAN RIVER IN KIANGSI

After the heavy floods along the Kan River in the summer of 1924 our Kiangsi Committee carried out a dike reconstruction program costing \$200,000.00 in the Kan River delta. This work protected rice crops worth several million dollars annually.

KWEICHOW'S FIRST MOTOR ROADS

The Commission co-operated with the Government of Kweichow in 1927 in the work of laying out and constructing 600 miles of well graded motor roads through that mountainous province. At the peak of the work 200,000 men were engaged on the construction. In this work soldiers, school boys and girls, and farmers were enlisted. It was one of the outstanding movements of recent years in road construction in China. The Commission's Chief Engineer visited Kweichow both in 1926 and in 1927 to assist in laying out and organizing this work.

YUNNAN ROAD EXTENSIONS

Our Yunnan Committee began road construction in this province in the spring of 1927 building 15 miles of standard motor road that season to the east of Yunnanfu. The Chief Engineer visited this province both in 1926 and 1927 when in that part of China organizing work in Kweichow.

ACTIVITIES IN HOPEI PROVINCE

In the spring of 1928 the Shih Lu Irrigation Project was dedicated and farmers along the canals were furnished water for their fields. This project has cost the Commission to date nearly \$130,000.00, all of which is eventually to be repaid by the water users. The system serves 12,000 acres of land ten miles west of Peiping and takes water from the Yung Ting Ho.

The heavy rains of July, 1924, caused widespread damage to low lying lands in the Paotingfu-Tientsin area of Hopei. An extensive diking program was therefore laid out by the Hopei Committee and in 1925 and 1926 approximately \$400,000.00 was spent in rebuilding many miles of dikes particularly in the region

near West Lake, 25 miles east of Paotingfu, where the work was carried out in the spring and summer of 1925. On the whole this work was highly successful in the West Lake region where additional crops valued at no less than \$5,000,000.00 were harvested the next year as a result of this protection from flood.

Other equally important dike problems were undertaken in 1925 in Hopei including the closing of the breach at the east end of the famous Thousand Li Diike protecting a vast low-lying farming area known as Wen An Wa. Local officials had tried and failed to do this work after the floods of 1924 had made this area an immense lake. Now, with the new dike built by our Committee, the Wen An Wa is again under cultivation, transformed from a fish pond covering more than four hundred square miles into a protected wheat farming region, as it had been in previous years.

TU LIU FLOOD CHANNEL

A project that has taken no little attention of our engineers is the proposed Tu Liu flood channel for the protection of Tientsin from floods. It would tap the Hsi Ho 25 miles south-west of Tientsin and go east 45 miles to the sea. Its cost would be upwards of \$8,000,000.00, including certain necessary special structures. Our Commission has advocated the building of this utility but thus far has not been able to work out a method of financing it even in conjunction with the provincial government. The time is not yet ripe in North China for flood protection of this extent.

The Tanna Tunnel

A tunnel which on completion will be 4.8 miles in length in the Izu Peninsula in Japan is attracting keen attention among engineering circles the world over. It is the Tanna tunnel. Started more than 14 years ago the date of completion of that tunnel still remains indefinite. To date a sum of Y.21,500,000 has been spent and it is probable that more than Y.3,000,000 must yet be spent before the work is finished. The tunnel on completion will be 25,614 feet in length. Of this length 2,200 feet yet remain to be penetrated.

The Tanna tunnel will cut more than fifteen minutes in the journey between Kozu and Numazu, and it will replace the Gotemba route, skirting Mt. Fuji, from the regular Tokaido line.

A series of difficulties confronted the work on the tunnel. The interior of the Tanna mountain was found to contain hundreds of water veins. Sometimes the workers struck geysers which flooded the entire tunnel and paralyzed work for months. At other times due to earthquakes crevices broke out in the tunnel and its level deviated as much as six feet.

Scientists have since found that the Tanna mountain is of volcanic origin. Regions of sand, slime, dirt, stones and rocks have been confronted by the workers, and have increased the difficulties of work, while the danger of striking geysers and perils from cave-ins are ever present.

Due to such difficulties the cost of constructing the Tanna tunnel is reported to be unparalleled in tunnel construction. The per foot cost of the Tanna tunnel is set at Y.960.

The greatest casualties in the construction of the tunnel have been taken by cave-ins and by sudden outpourings of water. In the Izu earthquake of November, 1930, a cave-in within the Mishima entrance of the tunnel took three lives. Prior to that in April 1921 a huge cave-in at a point 960 feet from the Atami entrance took sixteen lives. Another major accident took place in February 1922 when a cave-in occurring at a point 4,950 feet from the Mishima entrapped 16 men, who subsequently were drowned as the tunnel became flooded.

At present the total volume of water which is gushing from 70 crevices within the tunnel amounts to 26 cubic feet per second from the Atami entrance.

To bore through this mountain of volcanic origin with its hundred obstacles the engineering talent of Japan as well as the West have been resorted to. Where it was found that the pressure of water gushing from crevices was too strong to oppose by mechanical means, changes were made in the original direction of the tunnel. Minor leaks in the tunnel have been conquered by cement fillings under pressure.

If all goes satisfactorily the Construction Bureau of the Railway Department hopes to penetrate the remaining 2,200 feet sometime next year.

Flood-Lighting in the Far East*

Fine Effort at Singapore

IN connection with the recent flood-lighting display in London, comment was made on the possibilities presenting themselves for the extension of the modern means of illumination to the beautiful buildings of the East. The first examples have come to hand in the form of two photographs from Singapore which appear in the current number of *The Osram G.E.C. Review*, and which, by courtesy of the editor of that publication, are reproduced here. Not only do they show the wonderful results obtained by flood-lighting, but they reveal two specimens of architecture as applied in the East which are remote from the conception conveyed by writers of fiction, who still tell us that in this land of "always afternoon" they do their business under the shade of the sheltering palm.

The two schemes of flood-lighting illustrated were staged in connection with the recent Singapore Manufacturers' Exhibition, which was held at the new F. M. S. Railways Terminal Station at Singapore.

At this station, a flood-lighted view of which is seen in Fig. 2, the main hall and platforms were utilized for staging the various exhibits with extremely satisfactory results. The flood-lighting of the front of the building was contrived by six G.E.C. type F. 5719 flood-lights mounted 25-ft. from ground level equipped with 1,500 watt Osram lamps. The corner of the building was flood-lighted by five type F.5717 G.E.C. units situated at ground level and spaced 25-ft. apart, 500 watt Osram lamps being employed. Similarly



Fig. 1.—G.E.C. Flood-Lighting at the Singapore, F.M.S. Municipal Offices

equipped units were utilized for the flooding of the side elevation of the building.

The view—judging by the large number of cars seen in the foreground—gives some indication of the widespread interest created by the Exhibition. In this connection the constant arrival and departure of cars with their powerful headlights gave the photographer a certain amount of anxiety, the trail of their lights being plainly revealed in the illustration.

The flood-lighting of the Singapore Municipal Offices was carried out by means of twelve F.5727 G.E.C. floods equipped with 1,500 watt Osrams. The units were fixed at ground level about 30-ft. apart, and at about the same distance from the face of the building. The excellent results achieved are plainly visible from our view (Fig. 1), from which it will be seen that the lighting was so applied that pleasing shadow contrasts were introduced which had the effect of revealing the various columns and architectural details to their fullest advantage.

The flood-lights and Osram lamps were supplied by the General Electric Co., Ltd., of Singapore, whose illuminating engineers were in active collaboration with the authorities in designing and carrying out these two very excellent examples of modern flood-lighting in the Far East.

The installations excited much favorable comment among the local populace as well as those taking part in the Exhibition, and since they may possibly foreshadow many other similar installations in this part of the world, the outlook for flood-lighting may be looked upon as a distinctly encouraging one.

*Eastern Engineering and Commerce



Fig. 2.—G.E.C. Flood-Lighting of the new Singapore F.M.S. Railway Station at a Recent Exhibition

Plans in Manchukuo

While the Manchukuo Government is drawing up various constructive plans for the promotion of industry in the country and is contemplating the early execution of these constructive programs, the state operation of electric industry is the subject of primary attention of the Government leaders in view of its social and economic value.

In this connection, the Government, as the result of close study, is reported to have decided to approach the subject in accordance with the following basic principles:

1. The entire supply of electrical power in territories under the jurisdiction of Manchukuo shall be made Government monopoly.
2. Prior to realising the state operation of electrical enterprises, all electric companies existing shall be amalgamated.
3. A few of big sized power stations instead of many smaller ones shall be established.
4. Several water power stations shall be constructed.
5. The use of electric lamps and electric power among the masses shall be encouraged.—*Press Union*.

The Lake Balkhash Copper Works

ONE of the world's largest copper mining and smelting plants, with an annual capacity of 175,000 metric tons of copper, is to be built at Bertiss, at the western end of Lake Balkhash, in eastern Kazakhstan. Its cost of construction is estimated at 450 million roubles (\$232 million), of which 100 million roubles were allotted this year for preliminary work and initial construction operations. The plant is scheduled to be completed and in full operation in 1935, when it will account for half the total copper production of the country. The first section, to be finished in 1934, is expected to produce 25,000 tons of copper in its first year of operation. The concentration plant will be built in sixteen sections and will have a daily capacity of 48,000 tons of ore. The sulphurous gases will be utilized for the production of sulphuric acid and nitrogen fertilizers.

It is planned to complete the construction of a copper mine and the concentration plant by 1933. This smelter will be equipped with the most up-to-date machinery, part of which will be ordered abroad. The designs, which are already completed, were the joint work of Soviet and American engineers. The construction difficulties to be overcome are great; for example, in shipping materials during the initial operations it was necessary to employ two thousand camels, many of whom died because of the lack of proper feed.

The country surrounding the site is entirely barren, resembling somewhat the northern section of Nevada. The climate, however, runs to extremes: in winter the thickness of the ice is often as much as seven feet, while in summer the heat is so great that eggs can be cooked in the hot sands.

Construction Problems

There are virtually no roads, no navigable rivers, and no inhabitants. Camels have been and still are the chief means of transportation. The nearest railroad station to Lake Balkhash on the Trans-Siberian Railway is Petropavlovsk, about 550 miles from the northern part of the lake. To the south, it is about 100 miles from the site of the plant to the nearest point on the Turkestan-Siberian Railway.

Another section of a railroad which will connect the Trans-Siberian Railroad at Petropavlovsk and the Turk-Sib at Lake Balkhash was completed at the end of last summer. It runs a distance of 316 kilometers (196 miles) from Borovoye through Akmolinsk to Karaganda Mines. The first section, from Petropavlovsk to Borovoye, was built previously. Karaganda Mines is about 250 miles north of the site of the Lake Balkhash copper project.

The principal means of transportation at first will be by Lake Balkhash, the eastern end of which touches the Turk-Sib. The channel in the lake is to be deepened and docks and yards built for the production of ships and barges. Building materials



Part of the Karabash Copper Plant in the Urals

will be shipped across the lake from the railroad. It is estimated that 300,000 tons of freight will have to be transported this year.

At Karaganda are to be found the third largest coal deposits in the U.S.S.R., estimated to contain 15 billion tons. These will be available for the use of the copper plant, mine, the railroad, etc. A temporary electric station is to be built this year to supply power for construction, and will later be expanded to 212,000 kilowatts. A number of plants will also be built immediately to produce ordinary brick and concrete blocks. A sawmill and wood-working plant will also be built, and the production of stone, sand, gravel, and lime organized. It is estimated that 19 million roubles' worth of equipment is needed for initial operations. The water requirements of the copper plant will necessitate the construction of a huge system larger than the Moscow water system.

Work will be started immediately on the construction of houses for the workers. Nurseries are being organized for trees to be planted around the site of the plant and in the city to be built. The latter will be in the desert steppes, where now only an occasional yurt (nomad's felt-covered hut) is to be seen. This year the town is expected to have a population of 30,000, made up of the construction workers and their families, and later of 50,000. Several large livestock, grain, and vegetable farms are to be established to insure an adequate food supply. Three hospitals will be built, one at Kounrad and others at Balkhash and Boorly-Tyuba.

The ore for the plant will be mined at Kounrad, about 15 miles north of Lake Balkhash. The intensive character of the operations may be seen from the fact that 20 million tons of ore, with a copper content of 1.2 per cent, will be mined there every year. The engineers of the Giprotvetmet (the State Institute for Designing Non-ferrous Metal Plants) and the Balkhash plant are working on the problem of procuring this amount. Both underground and surface mining will be used and the mines are being designed on this basis.

The resources of the Kounrad district are estimated to contain 1,600,000 tons of metallic copper. Kazakhstan as a whole has the richest deposits of non-ferrous metals in the



John K. Calder (center) with an Official of the Magnitogorsk Steel Mill and Mr. Calder's Interpreter.

country, over 50 per cent of the present known resources of copper being in this republic.

Chief Engineer Sails

John K. Calder, American engineer, who will be in charge of the construction of the Balkhash copper plant, sailed for the U.S.S.R. on May 6 after a vacation in the U.S. He is one of the outstanding American engineers working in the Soviet Union, having been chief construction engineer on the Stalingrad and Cheliabinsk tractor plants and the Magnitogorsk steel mill, and later consulting engineer to the Stalmost (Steel Construction Trust).

Mr. Calder was engaged in June 1929 by the Stalingrad Tractor Plant Construction Board, through the Amtorg Trading Corporation. He acted as chief superintendent of construction, and under his direction and that of V. I. Ivanov, head of the Stalingrad Construction Board, the buildings of the plant, with a capacity of 50,000 tractors, were completed by February 1930, i.e., in the record time of eight months. Within a year from the beginning of construction the plant was ready for the installation of machinery, an achievement considered remarkable in engineering circles.

In June 1930 Mr. Calder was engaged to supervise the construction of the Cheliabinsk tractor plant, which will also have a capacity of 50,000 tractors. He put in the foundation, but due to lack of steel the work was temporarily held up. Last year he was assigned to supervise construction on the Magnitogorsk steel mill and was instrumental in expediting the erection of this plant.

Mr. Calder has been active as a construction engineer for the past 30 years. He was chief of construction on the Ford automobile plant at Dearborn.

Statement of Mr. Calder

Before sailing Mr. Calder gave an interview to the press in which he advocated the establishment of normal diplomatic and trade relations with the Soviet Union. "If Congress would only send a delegation over to study the place and see for itself what is going on there," he said, "they would understand that Russia is a menace to nobody and a vast potential market for American goods. It will take the Russians years to supply their own needs, and the only exports will be those which will enable Russia to buy goods in other countries."

As to conditions of American engineers in Soviet industries, he stated: "A man who goes to Russia to work will get on. The man who goes there to grouch, or butt in on their politics might as well get out. There's also this business of 'to-morrow,' of putting things off. Many men have been defeated by it. But the man who does his job directly and honestly does not have to worry."

Regarding his experiences with Soviet workers, Mr. Calder said: "The mechanics at first were not trained; they did not understand machinery. But mechanics have been developed whom I would not exchange for those anywhere else. How did they develop like that? By experience and study. Many of the men attend night school three nights a week. They absorb learning like sponges—they're hungry for knowledge. And they make wonderful mechanics. That includes not merely the older men, but the women as well."

"At first you've got to watch every block, line, and crane for the Russian worker. But put something up once for him and he will put it up right a thousand times thereafter. Put a Russian worker on a plant or machine and he'll know every nut, bolt, and bar before he's through. They'd drive you crazy with questions, want to know everything. But you don't have to tell them twice."

Chinese Wood-Oil Trade in 1931

ALTHOUGH China is still producing the best wood-oil in the world, the foreign demand showed no increase in 1931. Many reasons have been given for this unexpected state of affairs, but the most important is the world-wide economic depression, which has seriously affected the export of many Chinese products.

China is richly endowed with wood-oil resources, and for a number of years has supplied a large percentage of the world's demand. In former years the enormous fluctuations of supply and demand caused rapid and wide variations in prices, but last year the market was exceptionally dull on account of decreasing foreign demand. The reasons for the shrinkage of exports were two—on the

one hand, foreign importers, fully aware of the danger of speculative hoarding, began to adopt a more conservative policy and reduced their usual volume of purchases, while on the other hand Chinese merchants, seeing it was impossible to reduce prevailing prices, preferred to keep their stocks rather than dispose of them at a heavy loss.

In April a number of steamship companies reduced the freight for wood-oil shipped to Europe to 20s. per ton with a view to encouraging shipments of this product; but this plan was checked by the promulgation of new regulations by the Chinese Government, raising the export duty on wood-oil from .45 to 1.60 Haikwan taels per picul. In May, however, there was a sudden and sharp increase of exports to both Europe and America from Shanghai and Hankow, but this revival was of so temporary a nature that it did not add anything very substantial to the year's total export. In fact, this brief revival of trade was not so much due to reduction of freight as to an attempt by merchants to avoid the new tax regulations coming into effect on June 1. In Hankow there was some increase in the domestic demand on account of wood-oil being used as an illuminant in place of kerosene, which had become more expensive as a result of the silver slump. One estimate put the amount of wood-oil used in place of kerosene at about 2,400,000 pounds.

In early autumn the supply of oil was suddenly cut short by severe floods, and some speculative merchants began to accumulate oil and keep it off the market, expecting very profitable business through this manipulation, but as soon as they realized the very extensive nature of the floods they became anxious to dispose of their stocks and had to accept considerably lower prices than they had anticipated.

In September and October, with the coming of the Manchurian trouble, Chinese wood-oil commanded higher prices abroad, though there was little change in the Hankow market. In the early part of November the foreign demand continued brisk in consequence of the decreasing supply from Hankow caused by lack of transportation on the upper Yangtze. Peak prices for the year were reached both in America and Europe, there being an increase of approximately 2½ cents per pound in the former market and £5 per ton in the latter. Toward the end of December, however, business was marked by another spell of general weakness.

The following tables show more clearly the trend of China's wood-oil trade and price fluctuations during the last year:—

EXPORTS FROM SHANGHAI IN 1931

	To Europe (Piculs)	To America (Piculs)	To Japan (Piculs)	To Australia (Piculs)	Total
January	1,765.28	2,986.30	371.00	—	5,122.58
February	2,502.28	2,979.23	610.20	—	6,091.71
March	5,131.26	1,528.01	372.60	—	7,031.87
April	4,425.96	2,976.66	648.00	—	8,050.62
May	4,731.33	4,458.56	1,323.00	—	10,512.89
June	183.00	913.61	329.00	—	1,425.61
July	2,445.16	301.40	286.20	270.72	3,303.48
August	2,982.23	419.31	528.80	—	3,930.34
September	6,310.47	1,452.55	734.40	—	8,497.42
October	3,238.34	611.11	326.70	355.84	4,531.99
November	2,571.01	464.51	—	322.05	3,357.57
December	1,476.83	1,777.11	216.00	234.00	3,703.94
Total	37,763.15	20,868.36	5,745.90	1,182.61	65,560.02

PRICE FLUCTUATIONS DURING 1931

	Hankow (Hk. Tls. per Picul)	America (Cents per Pound)	Europe (Pounds per Ton)
January...	23.00	5½	37½
February	23.25	5½	37½
March	20.50	5½	37½
April	20.25	5½	37½
May	20.80	5½	36
June	21.50	5½	34
July	23.50	6½	37
August	22.50	5½	36½
September	22.00	6	39
October	21.50	6½	44½
November	23.40	7	49
December	21.00	5½	48

—Chinese Economic Bulletin

The Alluvial Tin Mining Industry of the F.M.S.*

Progress of the Principal Companies

THE progress and prosperity of the Federated Malay States within the last few decades is undoubtedly due to the rubber and tin mining industries, and the revenue obtained directly and indirectly has been utilized for the development of the country. With regard to tin mining, the primitive methods which were so effective for the working of the richer deposits, being no longer able to produce tin ore at a rate of profit with the metal at its present price, have been supplemented by large electrically-driven bucket dredges, which can work economically low grade areas. In general design, however, the modern dredges differ only slightly from their immediate predecessors, but experience in handling deep ground which involves a heavy strain on all parts, has led to certain important modifications.

The past year, from the standpoint of production and selling price, has been one of depression, but with the introduction of compulsory restriction in March last better prices have prevailed and as, when prices are low, cost of production is a highly important factor, companies operating plants at a low cost per ton of concentrates recovered have decided advantages. Owing to the fall in price of tin many companies have disappeared or temporarily suspended operations, but companies with highly trained technical staffs, the command of ample financial resources, and with directors of experience in alluvial tin mining, are still able to show profits, even with the metal at its present low price. From a study of the following particulars it can be seen that companies which have areas of fair average value, efficient plants and good management, stand to benefit from any rise in the price of metal, and sound companies that have survived should eventually be in an enviable position.

Malayan Tin Dredging Co., Ltd.

As one of the leading mining companies in the F.M.S., this undertaking is one of the most important enterprises of its kind, and with its moderate issued capital of £200,000 has a fine dividend record. The total area held by the company is now 2,177 acres, of which 953 acres had been worked out to June, 1931, leaving 1,224 acres remaining to be worked. The company installed six dredges, but during 1930 two were closed down after many years of useful working, as it had been decided to instal a new dredge embodying all the latest improvements in dredging practice, and designed to handle a working capacity of 250,000 cubic yards monthly.

This machine, which commenced work in May last, has not experienced any difficulty in handling the estimated output monthly, and has thus proved itself a most valuable acquisition to the fleet. Indeed, for the last few months the new dredge has been responsible for winning the bulk of the production. On account of the voluntary and official schemes of restriction the whole plant was closed down in August and September, 1930, and two dredges were laid up in May last, when the new dredge started, in consequence of which the yardage treated during the year ended June 30 last fell from 6,143,900 cubic yards in the preceding year to 4,977,500 cubic yards, and 1,459½ tons of tin ore were recovered, against 1,529½ tons in the year before. The average ore content of the ground was slightly better at .49 kati per cubic yard, as compared with .42 kati per cubic yard in the preceding twelve months. Owing to the decline in the price of tin the average price received was £72 6s. 6d. per ton or £38 14s. 2d. less than the average for the previous year. Notwithstanding restriction, the mine working costs were again reduced, and amounted to 3.15d. per cubic yard, as against 3.75d. in the preceding year. In view of the heavy curtailment of output, this reduction in costs reflects great credit on the management. As was to be expected, the profit for the year ended June 30 last was affected,

and at £37,978 showed a decline of £43,512 when compared with the previous year. Dividends totalling 17½ per cent were paid, against 47½ per cent during 1929-30, and the sum of £113,422 was carried forward.

Southern Malayan Tin Dredging, Ltd.

This company has four modern dredges at work on its area of 2,052 acres in the Tanjong District of the State of Perak. During the year ended June 30, 1931, owing to restriction the ground treated fell to 7,776,500 cubic yards, as compared with 8,845,700 cubic yards for the preceding year, the quantity of tin ore recovered being 2,075 tons, against 2,017 tons during the previous year. The average recovery value per cubic yard was better at .448 kati, as compared with .38 kati in the previous year. Working costs, notwithstanding the restriction measures, were again reduced and amounted to 2.49d. per cubic yard, but the average price received for the ore was £71 12s. 2d. per ton, as compared with £110 9s. per ton for the previous year. As a result of the limited production the profit for the financial year ended June 30, 1931, was £43,424 and dividends totalling £32,858 or 10 per cent were paid, as compared with 30 per cent for the previous year, while on account of the current year 5 per cent was paid in December, 1931. Close attention has been paid to the dredges, and improvements have been effected which have resulted in increased efficiency. The company is assured of a long life as the area remaining unworked at June 30, 1931, covered 1,800 acres, the dredges having worked 64 acres during the year. Production during the first half of the current financial year was 661½ tons ore, the working profit being £24,740, thus showing that with its low working costs the company can face even the present price of metal and still make profits.

Southern Perak Dredging, Ltd.

During its eleven years of existence this company has paid £200,000 in dividends. The capital is £150,000. It still holds 990 acres unworked, out of a total area held of 1,276 acres. The property, which is situate at Temoh, Perak, F.M.S., is being worked by two dredges, the quantity of ground treated during the year ended June 30, 1931, being 2,720,600 cubic yards, from which 491 tons tin ore were recovered. The price received for the ore averaged £72 8s. 7d. per ton, or £36 2s. 5d. per ton less than the previous year, when the output was 863 tons. Mining costs at 10.5 cents per cubic yard showed a reduction of 3.3 cents, and the average ore content per cubic yard was .3 kati, as against .46 kati for the preceding year. During the year No. 1 dredge was stopped for 4½ months for overhaul and installation of jigs. Dividends paid totalled 2½ per cent, as against 18½ per cent for 1929-30, and 30 per cent for 1928-29. During the six months ended December 31 last, with the plant working at less than 50 per cent of capacity, the company is still able to show a balance on the right side, the working profit being about £2,032. Economy is being studied in every possible direction with a view to reducing costs, and when trade improves and the price of tin recovers, this company should enjoy a return to prosperity.

Tronoh Mines, Ltd.

As one of the oldest and most successful companies in Malaya, the progress of this undertaking is always watched with the greatest interest, the shares being very popular amongst investors. The company's property has a total area of 4,724 acres, part of which

*From *The Mining Journal*

is situated at Tronoh and part at Tanjong Tualang. The company owns five dredges. The original Tronoh area is being worked by two dredges (Nos. 2 and 3). On the Kampar section at Tanjong Tualang dredges Nos. 4 and 5 started work during 1928, the company's latest dredge (No. 8) being now ready to commence operations as soon as conditions permit. During 1930 the total output of ore, including the ore produced by tributors, was 1,447 tons, or 416 tons less than in the preceding year. Of this total the dredges produced 834 tons of ore, which realized £76,567, as compared with 1,324 tons value £169,403 in 1929. The average price obtained was £91 16s. 1d. per ton, against £128 in the previous year. Tributors' ore produced a profit of £8,827, or £1,900 less than in 1929. The average cost per cubic yard of No. 2 dredge was 5.98d. and by No. 3 dredge 5.4d. On the Kampar section the working costs of No. 4 dredge was 3d. per cubic yard and No. 5 dredge 3.19d. No. 3 dredge has been reconditioned and converted to electric drive, and the wooden pontoon changed to a steel pontoon. In view of the restriction policy, the output for the past year can be considered as satisfactory, the total dredge production for the year ended December 31, 1931, being 876 tons.

During the 21 years from its incorporation in 1901 to the end of 1923, cash distributions amounting to no less than £5 14s. per £1 share were paid, of which £4 1s. per share was paid free of tax. In addition, there was a bonus issue of one share for every four shares in October, 1919, and one for every eight in October, 1925, while during 1928 93,127 shares of 5s. each were issued at 15s. each, and during 1929 100,000 shares of 5s. each were offered to shareholders at 20s. each credited with 10s. per share paid, making the issued capital £300,000. Dividends during the past seven years have been as follows: For 1924, 25 per cent; 1925, 22½ per cent; 1926, 25 per cent; 1927, 30 per cent; 1928, 20 per cent; 1929, 32½ per cent; 1930, 12½ per cent; in 1931, 5 per cent. At July, 1931, the investments taken at cost totalled £378, consisting chiefly of investments in tin mining companies operating in the F.M.S.

The company is interested in the Puket Tin Dredging Co., Ltd., which has been formed to work a valuable tin property in Siam, the Tronoh Co., holding one-third interest, and the Waihi Gold Mining Co., Ltd., the remaining two-thirds. A dredge is being installed which it is believed will be able to make profits on tin at low prices.

Southern Tronoh Tin Dredging, Ltd.

Formed in 1927, this company acquired from Tronoh Mines, Ltd., 600 acres at Tanjong Tualang, Perak, with two dredges in course of construction. The first of the company's dredges commenced opening out operations in February, 1929, and the second dredge started in May, 1929, and commenced recovering tin ore in September. Operations have been handicapped owing to the restriction policy, with the result that the present production does not reflect the full earning power of the dredges, the output for the year 1930 being 566 tons of tin ore, of which No. 1 dredge contributed 348 tons, and No. 2 dredge 218 tons. Costs averaged 4d. per cubic yard which, considering the harassing period and intervals of stoppage, can be considered very satisfactory. During the past year the output was 442 tons of a value of £30,784, the working profit being £9,007. The company entered the dividend paying stage in July, 1930, with an initial payment of 2½ per cent. On the return of normal conditions and granted a fair price for its product, the company can look forward to a successful future, and being moderately capitalized at £200,000 satisfactory dividends should be distributed.

Idris Hydraulic Tin, Ltd.

This company's property is situate in the Kinta Valley of Perak, and is being worked by monitors, elevators and gravel pumps. Work is at present directed to two sections, known as Batu Karang and Kranji, the output for 1930 being 353 tons, as compared with 450 tons in 1929, the decrease being due to the poorer ground treated, the average value per cubic yard being 34.38 cents (9.63d.), as compared with 62.76 cents (17.57d.) for 1929, a decrease 8d. During 1931 the output was 312 tons, the estimated working profit being £3,301. During 1929 four dividends of 5 per cent each were paid, while in respect of 1930 a dividend of 2½ per cent was paid in March, the reduction being due to the lower price of tin, the lower-grade

ground treated, and in addition, to the restriction of output. Development is being continued on both sections, and owing to the difficulties of mining operations at the Kranji Section on account of the proximity of the railway and the Government main road, the company has acquired an adjoining 72 acres, equipped with machinery and electrical plant which will permit development of the southern end of the Kranji paddock, and will add a considerable volume of rich ground. Owing to the sound financial position of the company, the cost of this acquisition—about £22,000—was carried through without the necessity of raising any further capital.

Ayer Hitam Tin Dredging, Ltd.

This company, with its moderate issued capital of £180,000 owns 1,032 acres, and possesses one of the largest dredges in the Federated Malay States. Digging operations commenced in June, 1929, but the payable area was not reached until some months later. The first return was made at the end of November, 1929, and the total output to June 30, 1930, was 562.7 tons of tin ore, which realized £59,778, or an average of £106 4s. 8d. per ton. A maiden dividend of 2½ per cent was declared in June, 1930, and since then dividends of 2½ per cent were paid in January, March, June, September and December, 1931. During the year ended June 30, 1931, the dredge treated 2,287,829 cubic yards for a recovery of 970 tons tin ore, which realized £73,330, or an average of £75 11s. 6d. per ton, and if the previous year's prices had been maintained, the revenue would have been increased by nearly £30,000. Working costs at 2.9d. per cubic yard made the company one of the cheapest in the F.M.S. The average value of the ground treated was quite up to expectations at .7 kati against .52 kati in the first year of working. The dredge is at present working on a selected area of 350 acres, of which 32 acres had been worked to June 30, 1931, and this area alone will give a life of 26 years with one dredge at work, but it is expected that other portions of the property will be profitably worked, when further boring has been done. Operations were suspended for two months during the latter half of the past year, which has had an adverse effect upon costs and production, the output being 404½ tons tin ore, value £31,550, the estimated mine profit being £21,600. The satisfactory working of a dredge built to dig at 120-ft., reflects great credit on the designers and engineers responsible for construction.

Sungei Besi Mines, Ltd.

The position of the company has materially altered as a result of the commencement of operations on the Sungei Besi Village Area, as this contains much richer ground than the old property, which, during 1930 produced 499 tons tin ore, value £49,868, the average price realized per ton of ore being £100, as against £132 per ton in 1929. The average value of the ground treated was 5.14 katis, or 6.84 lbs. per cubic yard, which was .31 lbs. better than the preceding year. The net profit was £5,155, and after paying a dividend of 2½ per cent, there was a surplus of £32,052 on profit and loss account carried forward. The new open cast on the Village Area has been equipped with an electrically operated power shovel and a new treatment plant. A new hydro-electric scheme has been carried out at a cost of £140,000. After work on the Village Area had been in progress for only a few months, costs were reduced to the extent of 5 cents a yard, and with values improving a substantial advance in output is anticipated during the current year. Operations during the past year show little difference from the preceding year, the output being 481 tons tin ore, which yielded a working profit of £4,807.

During the past year the company was interested in the flotation of Pelepah Tin Dredging, Ltd., the whole of the capital with the exception of £20,000 is being subscribed by Sungei Besi Mines, Ltd. As can be seen from the particulars below, there can be no question but that the Pelepah property is a valuable one, and granted a reasonable price for the tin, will be of considerable benefit to the Sungei Besi Company.

Pelepah Tin Dredging, Ltd.

Formed in March last, this company acquired from Sungei Besi Mines, Ltd., a sub-lease of alluvia tin mining property, with an area of 1,092 acres, at Kota Tinggi, State of Johore. The

properties were tested by bores, under the direction of Mr. G. W. Simms, the General Manager of Sungei Besi Mines, Ltd., and on a selected area of 974 acres there is an estimated yardage of 49,682,000 cubic yards, with an average value of 0.49 kati per cubic yard and in addition there are a further 118 acres of lower-grade ground containing about 6,000,000 cubic yards. Orders have been placed for a dredge with a monthly capacity of 250,000 cubic yards, and with the metal at anywhere near the present price, it is anticipated that satisfactory profits will be returned as low working costs are assured.

Sungei Way Dredging, Ltd.

The area held by this company cover 1,177 acres in the Selangor District, of which 925 acres have been proved by boring to contain 83,845,025 cubic yards of ground of an average value of 0.56 kati per cubic yard. A dredge commenced work in October, 1926, followed by a second dredge in December, 1928, while in October, 1930, a third dredge started operations. Results have been very satisfactory, the output during the year ended June 30, 1930, being 977 tons tin ore, value £96,884, or £99 3s. 1d. per ton, costs amounted to £45 12s. 5d. per ton, those showing a profit of £53 10s. 8d. per ton, which enabled dividends aggregating 15 per cent to be paid, bringing the total dividends paid since the commencement of dredging to 60 per cent. With the new No. 3 in commission, increased returns were obtained during the year ended June 30, 1931, the tin ore produced amounting to 1,119 tons, although operations were interfered with by restriction of output. Results during the past six months show a falling off due to the same cause, the output of tin ore totalling 342 tons, and the value £23,850, the mine profit being £7,650. Costs have been reduced to the very satisfactory figure of 3.59d. per cubic yard, which in view of the curtailment of production reflects great credit on the management. The outlook for the company can be considered very satisfactory, as with its large unworked area, sufficient to keep the three large dredges at full work for quite seventeen years, it will be one of the first to benefit in any revival.

Kent (F.M.S.) Tin Dredging, Ltd.

Since dredging commenced on this company's property at Kuala Lumpur in the F.M.S. in June, 1928, results have been very satisfactory, and despite depressed markets and the low price of tin, has already reached the dividend paying stage, with distribution of 12½ per cent for 1928, 25 per cent for 1929, and 5 per cent for 1930. During 1930 the ground treated was 1,555,960 cubic yards, a decrease of about 256,120 cubic yards when compared with the previous year, this decrease being partly due to a greater quantity of clay encountered, and to stoppages to regulate production, and although the yardage treated showed a decrease it was possible to reduce the average cost of treatment to 2.99d. per cubic yard. Production of tin ore during 1930 was 379½ tons, as compared with 573½ tons during 1929, while during the past year with restriction in force, the output was 306½ tons of a value of £19,520, the working profit being £1,295. During 1930 the area dredged was approximately 18 acres, making the total area worked out to that date 53 acres, and as the proved area covers 361 acres, there is sufficient ground left for at least another sixteen years.

Gopeng Consolidated, Ltd.

A good standard of output and low level of working costs is still being maintained by this company, which enables it to face the fall in the price of tin with complete confidence and equanimity. The company has the distinction of being the first to work alluvial tin bearing ground in the F.M.S. by means of hydraulic, and its dividend record is proof of the success which has been attained, and at the present time the company is one of the cheapest producers of tin ore in the world, the average all-in cost of production for the year ended September 30, 1930, being £78 per ton of metal. This sum included £16 per ton for depreciation and £17 per ton for royalty. Owing to the restriction, the yardage treated during the year showed a decrease of 141,100 cubic yards when compared with the previous year, the average tin ore content being .97 lb. as against 1.03 lb., while the average cost of the treatment per cubic yard was 2.96d., a decrease of .44d. compared with 1929.

The company has enjoyed an enviable dividend record, recent distributions being 20 per cent for each of the years 1923-24, 1924-25 and 1925-26, 25 per cent for 1926-27, 16½ per cent for 1927-28, 20 per cent for 1929, 13½ per cent for 1929-30, while in respect of the year ended September 30, 1931, 1½ per cent was paid in January, April, July and September, and 1½ per cent on account of the current year paid January 7, 1932. The report for the year ended September 30, 1931, will be available in March, and, according to cabled returns from the mine, the output was 720 tons tin ore, the estimated working profit being approximately £30,590. The company is in a strong financial position having at September 30, 1930, investments valued at £93,930, the market value being in excess of this figure, and cash £37,609. Although the company has had to face declining tin prices during the past year and has curtailed its output, it is in a more fortunate position than many others owing to its being such a low cost producer.

Tekka, Ltd.

This company was originally formed in 1907 and after a successful career, in which it paid dividends and bonuses aggregating 77s. 6d. per share, in addition to certain interests in Tekka Taiping, Ltd., was reconstructed in 1920 for development purposes. The present company, like its predecessor, is securing very satisfactory results despite restriction and the fall in the price of tin. During the year ended March 31, 1931, the hydraulic plant treated 962,450 cubic yards, a decrease of 35,150 cubic yards when compared with the previous year, but owing to a slightly lower grade of ground, the output was 457½ tons tin ore, as against 540 tons. Value per cubic yard was 1.07 lb., against 1.21 lb., but this decrease was partly compensated for by a reduction in costs, the average being 4.68d. as compared with 5.75d. during 1929-30. The average price received was £74 10s. 5d. per ton, against £112 14s. 9d., the working profit being £33 9s. 2d. per ton, as compared with £68 10s. for 1929-30. During the past year the output has been curtailed with the result that for the nine months ended December 31, 1931, the production was 278 tons tin ore, the estimated working profit being £8,790. The dividends paid for the last four years have been 1s. 10½d. per share for 1927-28, 1s. 6d. and 6d. bonus for 1928-29, 1s. 6d. for 1929-30 and 10½d. for 1930-31, while in respect of the current year 3d. per share was paid in October, 1931.

Tekka Taiping, Ltd.

This company's new dredge (No. 3) commenced working in March, 1930, and the company now has three dredges in operation, which given normal conditions, should result in a large increase in output. The output for the year ended October 31, 1930, was 513 tons tin ore, a decrease of 20 tons when compared with the previous year, the returns being adversely affected by drought and the working of lower grade ground. It must also be remembered that the new No. 3 dredge did not commence production until May, 1930. The cost of production of one ton of metal was £108, an increase of £15 on the previous year, and there is no doubt that costs would have been much lower and the output higher if it had not been for restriction.

The area worked by the dredges was about 34 acres. The working profit was £13,097 and a dividend of 3d. per share was paid, and the substantial sum of £19,176 was carried forward. During the past year there has been an improvement in output, which reflects great credit on the management at home and abroad. For the year ended October 31, 1931, the production of tin ore was 591½ tons, an increase of 78 tons compared with the previous year, the recoverable value being £40,940, and the estimated working profit £13,765. The ground remaining to be worked will give a life of 14 years and in view of the depressed state of the tin industry the results now being secured can be considered as very satisfactory.

Pengkalen, Ltd.

This company's property, covering 1,083 acres near Lahat, F.M.S., is being worked by two dredges, No. 2 dredge having commenced in September, 1928. Since commencement the new dredge has given complete satisfaction and proved both efficient and economical, as can be seen from the following figures. During the year ended September 30, 1930, the No. 1 dredge treated 826,750 cubic yards for a recovery of 188.8 tons tin ore, against

902,140 cubic yards, and 378 tons the previous year, the decrease in the yardage treated being due to difficulties encountered in crossing the river and Government road. This was also responsible for an increase in costs, which amounted to 4.92d. per cubic yard, as against 3.99d. in the previous year. There was, however, an increased yardage treated by the No. 2 dredge, and a decrease in costs, a total of 1,816,420 cubic yards being treated for a yield of 522½ tons, as against 1,600,130 cubic yards, and 476 tons during the previous year. This dredge has since been working in a southerly direction and treating better ground with the result that increased output has been secured, the total from both dredges for the year ended September 30 last being 727½ tons tin ore, of an estimated value of £51,605, the mine profit being £25,865. The company's area now extends over 1,083 acres, of which 783 acres remained to be worked at September 30, 1930, thus assuring at least 25 years life. The dividend paying stage commenced in 1912-13, and with the exception of the two following years, distributions have been made each year, those for the last six years being as follows: 1925-26, 32½ per cent on Preference, and 22½ per cent on Ordinary; 1926-27, 32½ per cent on Preference, and 22½ per cent on Ordinary; 1927-28, 35 per cent on Preference, and 25 per cent on Ordinary; 1928-29, 50 per cent on Preference, and 40 per cent on Ordinary; 1929-30, 15 per cent on Preference, and 5 per cent on Ordinary; while in respect of the last financial year to September 30, 1931; 5 per cent was paid on the Preference in July; and 5 per cent in October, 1931. The company's power plant has been sold on a partnership basis to Lahat Mines, Ltd., Menglembu Lode Mining Co., Ltd., and Pengkalen, Ltd. The efficiency of the plant has been increased, which will effect a considerable saving in cost of power.

Kinta Tin Mines, Ltd.

In addition to its tin mining property at Kinta, F.M.S., the company owns half share of the Sanglop Rubber Estate, and quite a large holding in Tanjong Tin Dredging, Ltd. The Kinta tin mine is an open-cast working, the tin ore, being recovered by hydraulicing. The company has expended about £40,000 in renewing the Sinju pipeline, which will still further reduce costs, which are now down to the low figure of 3¼d. per cubic yard. During 1930 the output was 288 tons tin ore, which realized an average price of £85 15s., against £125 10s., the previous year. A dividend of 5 per cent was paid against 20 per cent for 1929. During the past year 255½ tons of tin ore were recovered, which yielded a mine profit of £5,006, these adverse figures being due chiefly to the price of the metal and restriction. The company owns 1,060 acres, thus assuring a long life, and although the company has been in existence 31 years, and has been a regular dividend payer, the setback can only be considered as of a temporary nature.

Tanjong Tin Dredging, Ltd.

During its six years of existence this company has been very successful, dividends of 25 per cent for 1928, 20 per cent for 1929, and 5 per cent for 1930 having been paid. The property covers some 596 acres in Perak District, of which 43 acres had been worked to December 31, 1930. A dredge with a capacity of 120,000 cubic yards monthly is at work and during 1930 treated 1,061,030 cubic yards for a recovery of 324 tons tin ore, as compared with 372 tons in 1929, the decrease being due to restriction. Costs per cubic yard at 4.14d. showed an increase of .21d., and due to the lower price of the metal the working profit was 2.70d. per cubic yard, against 3.83d. in the previous year. During 1930 the dredge worked 10 acres, and as 379 acres have been bored and are estimated to contain 35,458,200 cubic yards of an average value of 0.47 kati per cubic yard, the company is assured to a long life. Operations for the year 1931, although subject to regulation under the Restriction Scheme, show a slightly increased output at 328½ tons, but owing to lower tin prices, the value at £23,245 was lower than the preceding year, with the result that the mine profit was also lower at £7,711.

Power Agreement in Japan

THROUGH the efforts of Mr. Seihin Ikeda of the Mitsui Bank, and the resultant compromise reached between the representatives of leading electric power companies, the long contemplated Electric Power Federation has been finally realized with the

five largest electric enterprises, namely, the Tokyo Electric Light Company, the Toho Electric Power Company, the Nippon Electric Power Company, the Daido Electric Company and the Ujigawa Electric Company, as its nucleus.

While the federation constitutes only the first step towards the fundamental control of electric power industry, its final success is regarded as a matter of doubt. It is believed, however, that severe competition of unnecessary character which has been waged among the enterprises may be avoided by the federation.

The power companies have continued unscrupulous competition for some time past and as a consequence have been suffering considerably, their financial distress being particularly conspicuous recently due to the protracted economic depression.

The primary object of the federation is set forth as follows:

"In view of the fact that electric power industry is in the sphere of public utility and forms a basic factor for an industrial and cultural development of the nation, it should be controlled effectively and competitive duplication of equipment should be avoided in order to reduce production cost for the benefit of the public as well as for a healthy development of the industry itself. We therefore, hereby form the Electric Power Federation and affix our signatures to the agreement."

The agreement includes the following points:

- (1) The companies belonging to the federation agree to avoid unnecessary competition and duplication of equipment.
- (2) Even after the expiration of the existing contracts between the Federation companies covering supply of electric power, the companies agree to pay due respect to the principle of the contracts.
- (3) The Federation companies agree to fix by mutual agreement power charges and other matters in supplying power to the same district.
- (4) In the districts where power supply is overlapping, the Federation companies agree to abolish their power plants gradually, which are not as yet in operation. The companies also agree not to apply anew for the franchise of overlapping supply district.
- (5) In order to control supply of electric power, the Federation companies agree to supply power to each other and to use their electric equipment mutually.
- (6) Construction by the Federation companies or their subsidiary companies of a generation plant of more than 5,000 k.w. or a transmission line of over 50,000 volts or connecting transformation plant cannot be made unless an agreement be reached between the member companies.
- (7) The Federation companies agree to form a commission in order to prosecute effectively the control of electric power supply.
- (8) Advisers will be appointed for the Power Federation Commission.
- (9) In case the committee cannot agree, the decision will be determined by the advisers.
- (10) While the Federation companies will endeavor to carry out the present agreement in line with the principle of the electric power supply control, the advisers of the Federation Power Commission will render their assistance to promote the credit standing of the Federation companies and the stabilization of the industry.
- (11) The present agreement will remain in force for 10 years after formal signature.
- (12) Any electric light and power company desiring to join the Federation must obtain consent of the Federation Power Commission.

Although decision has not yet been arrived at as to the personnel of advisers to the Federation Power Commission, it is understood that the following financiers will be appointed: Mr. Seihin Ikeda of the Mitsui Bank, Mr. Kagami of the Mitsubishi interests, Mr. Yuki of the Industrial Bank of Japan and Mr. Yashiro of the Sumitomo Bank.

Going through the articles of the agreement and in view of the reported personnel of the Federation Power Commission, it may be said that the outstanding feature of the Federation is the bringing together of the business of the five largest electric enterprises of the country under the almost complete control of the financial interests. According to article nine, all disputes that may arise in the future among the Federation companies will be left in the hands of advisers to the Federation Power Commission.

—Japan Times.

Japan's Automobile Industry

SMALL in number as the total still is, automobiles are manufactured in Japan to-day as the makers have been under the special protection of the Imperial Army.

There were more than a dozen factories where military cars were tentatively manufactured in 1928 under the guidance of the Osaka Army arsenal. Included among these were the T.G.E. (the Tokyo Gas-Electric Engineering Works, Ltd.) and the Okumura Electric Co., Ltd., but to-day only the T.G.E. carries on the manufacture of military cars.

The Mitsubishi Zosen Kaisha, Ltd., Kobe works, the Osaka Jitsuyo Jidosha (the Osaka Practical Automobile Works), the Tokyo Ishikawajima Shipbuilding Works, the Hakuyosha, etc., attempted to manufacture general passenger cars, but all of them failed financially, and they were obliged to change into the manufacture of military cars.

The Osaka Practical Automobile Works and the Kaishinsha Works were amalgamated into the D.A.T. works, while the Ishikawajima Shipbuilding Works has made separate its automobile plant under the name of the Ishikawajima Automobile Manufacturing Works.

Three Auto Works

There are three automobile works which maintain operation at present. They are the T.G.E., the Ishikawajima, and the D.A.T. The last mentioned company has been engaged in the manufacture of four-cylinder trucks, chassis, and engines, but it was amalgamated with the Tobata Cast Iron Works, of Kyushu, on equal footing after the company's paid-up capital was increased from Y.465,000 to Y.900,000, in November last year.

The following table shows the manufacturing capacity of these three companies:

Names	Established	Capital (Y.1,000)	Capacity (annual)
Ishikawajima	... 1919	2,500	400
T.G.E.	... 1918	6,000	300
D.A.T.	... 1921	—	200

The actual manufacture of cars by these companies is far smaller than the foregoing capacity, as seen in the following table:

ESTIMATED ANNUAL OUTPUT OF CARS IN JAPAN.

Years	Number
1919	12
1924	136
1926	246
1927	302
1928	433
1929	376
1930	391

Most of the cars manufactured in Japan have been buses and trucks. It is surprising that the number of Japan built cars totalled only a little less than 400 in 1929 when the annual increase of new cars in this country amounted to 19,760, the percentage of the home made cars being slightly less than two per cent.

Up to 98 per cent of the entire demand for new cars in Japan in 1929, therefore, was met with imported machines. The fact that the import into this country of the parts is quite heavy as compared with that of the finished cars is explainable by the fact that the foreign cars are assembled in this country. The agreed import duty on the finished cars is 35 per cent, whereas that on parts is 30 per cent.

The Ford factory and the General Motors works have the capacity to assemble 10,000 and 17,000 cars annually, respectively, and then there are the Nihon Jidosha and the Asano Bussan which also import parts and assemble them in Japan. Under the present circumstances, there is no possibility that the Japanese works, with their deplorable equipment, will be able to compete with foreign manufacturers who have assembling works in Japan.

Effect of Protection

It is evident that the home automobile works might not have been able to maintain even their insignificant existence to-day but for the heavy tariff protection and the military automobiles subsidy act which was put into effect in 1918.

The primary object of the Army in giving subsidy to automobiles manufactured in Japzn was to encourage the construction and use of motor trucks from the military point of view; it has hardly anything to do with the encouragement of the automobile industry from its commercial aspect.

Nevertheless, the Army's subsidy happened to stimulate the industry to attain its present stage of progress. The Army subsidy system was inaugurated in 1918, but most of the budget was returned to the Treasury annually until about 1923, showing how inactive the automobile manufacturing industry was in those days.

During and after 1924, however, the budget was increased. It even reached Y.800,000 in 1929.

During the inauguration period of Japan's automobile manufacturing industry—prior to 1923—the Japanese makers turned out only from 10 to 50 cars qualified to get the subsidy. The number, however, jumped to 100 in 1924 and it is now between 250 and 260.

Subsidy Reduced

There were days when such a heavy subsidy as Y.3,000 was given for each new standard motor truck (1½ tons) manufactured. To-day, however, the amount has been reduced to Y.200. The makers are not the only ones who are subsidized; the buyers, too, are given a subsidy of Y1,000 for each standard motor truck they buy, and furthermore, they are given an annual maintenance subsidy of Y.600 each for five years.

This means that a user of a standard motor truck gets a total subsidy of Y.4,000 from the Army. But for the heavy protection, there would be none who would use the home-made motor trucks which are almost twice as expensive as American motor trucks.

Japan's automobile manufacturing industry has thus maintained its operation under the heavy dual protection of tariff and subsidy, and it will never be able to become independent in the near future unless the same protection is maintained.

While wages in Japan are smaller than those abroad, the materials, such as steel, alloy, aluminium, copper, plate glass, rubber, hides and leather, hard wood, zinc, and lead constitute 70 per cent of the entire cost of production here, whereas the identical items constitute 23 per cent of the cost of construction for a Ford car in America.

This means that Japan's automobile manufacturing industry depends much upon the parallel progress of the industries producing these materials.—*Osaka Mainichi*.

Chosen Plans for Timber Operations

Utilization of forest resources estimated to amount to 3,600,000,000 cubic feet, including settlement of lands and conservation of timber, forms one of the main projects of development for Chosen which is to extend over 15 years and involve the expenditure of about \$32,500,000 and which is to be started during the year, according to the *Seoul Daily Press*. About two-thirds of the money is to be spent for 625 miles of railways, to be completed in 1940, including some 320 miles of forest railways for lumbering enterprises. As far as possible, the forest railways will be open for general traffic as well; they are to extend between Gosin on the Kisshu-Keisanchin line and Mosan (190 miles), and between Keisanchin and the Everwhite Mountains (Hakuto San 130 miles). Surveying for these lines is planned for 1932 and commencement of actual construction for 1933. Expenses for the development of North Chosen are to be met principally by public loans, the repayment of which is to be met with income derived from the forests.

Batchworth Diesel Pumping Station

Rickmansworth and Uxbridge Valley Water Company Adopt Diesel Engines as Most Economical Prime Movers at Rickmansworth—Equipment Supplied by Messrs. W. H. Allen, Sons & Co., Ltd., Bedford

IN *Gas and Oil Power* (December, 1931), there appeared an exclusive description of a new Diesel-equipped sewage pumping station in one of the most rapidly-developing industrial and residential areas of London, namely, Acton. The case for Diesel drive for the pumps in such a station is a very fine one, and several of the arguments that apply to their adoption in such a case hold good where a waterworks pumping station is concerned, a field wherein, incidentally, the oil engine has made considerable headway.

One of the latest new waterworks pumping stations to be started up in England is the Batchworth station, Rickmansworth, of the Rickmansworth & Uxbridge Valley Water Company. This district is becoming increasingly popular as a residential neighborhood, being located in delightful country within easy access of London by a very good electric train service. With rapid expansion in nearby towns and villages served by the same water company, it became imperative to augment the water supply facilities of the area, and new pumping equipment was, therefore, ordered by the Rickmansworth & Uxbridge Valley Water Company, the contract being awarded to W. H. Allen, Sons & Co., Ltd., Queen's Engineering Works, Bedford.

The company has for many years operated pumping plant at Rickmansworth, which is driven by steam turbines and Crossley producer gas engines. Comparatively recently this was supplemented by a single-cylinder horizontal Blackstone spring-injection engine and force pump. The new equipment, which is here described for the first time, is located in a separate red brick power house some little distance from the original plant. The new station is quite close to the company's offices, and there is space alongside the new station for a duplicate power house, when this becomes necessary.

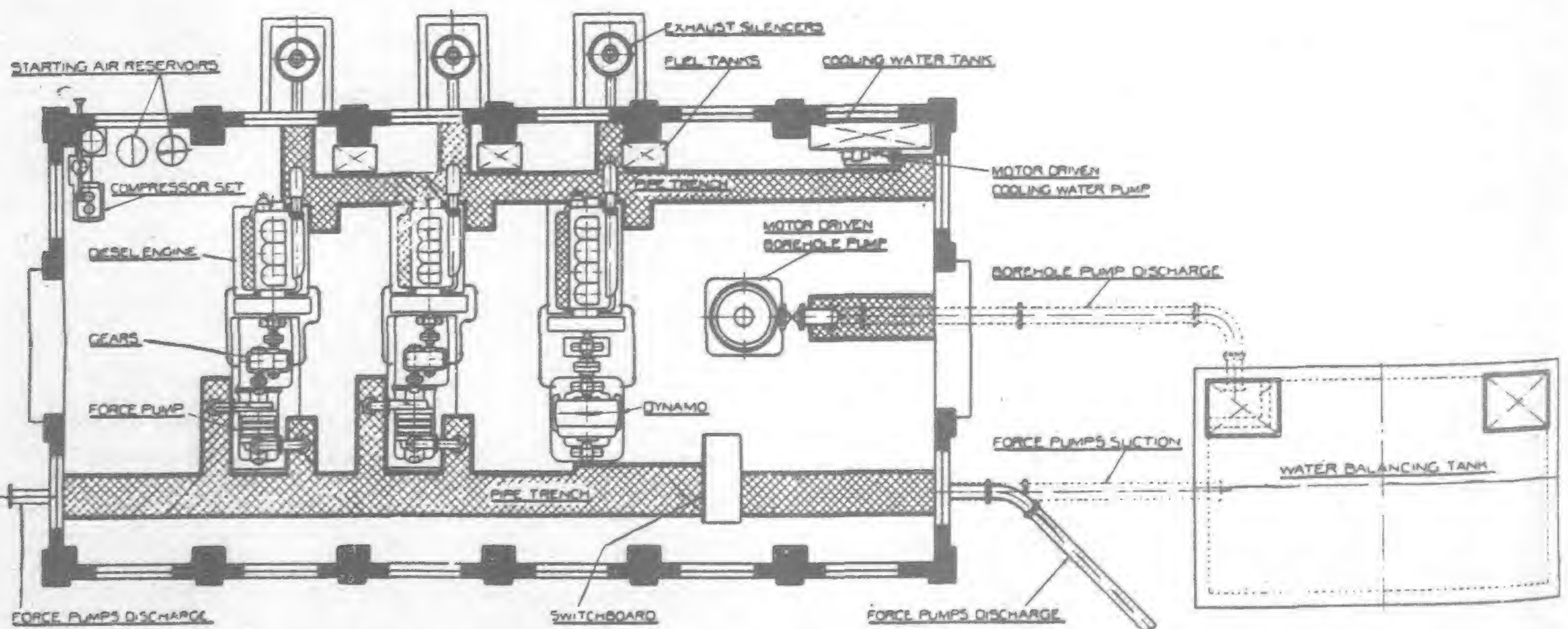
The arrangement of the Batchworth pumping station, as the new plant is called, is shown on the plan which is reproduced with this article, while two interior views of the pumping house are also given. The plan indicates that there are two force pumps, each driven by a three-cylinder Diesel engine, and one Diesel generating set, which supplies current to a motor-driven borehole pump alongside. The balancing tank is a reinforced concrete structure, and is placed just outside one of the doors of the station. The borehole pump discharges into this tank, and the force pumps suck from it, as the plan shows; the location of the main pipe trench, and of the force pump discharge line, is shown on the plan. Arrangements are

provided whereby the pumps can serve different reservoirs of the company's system.

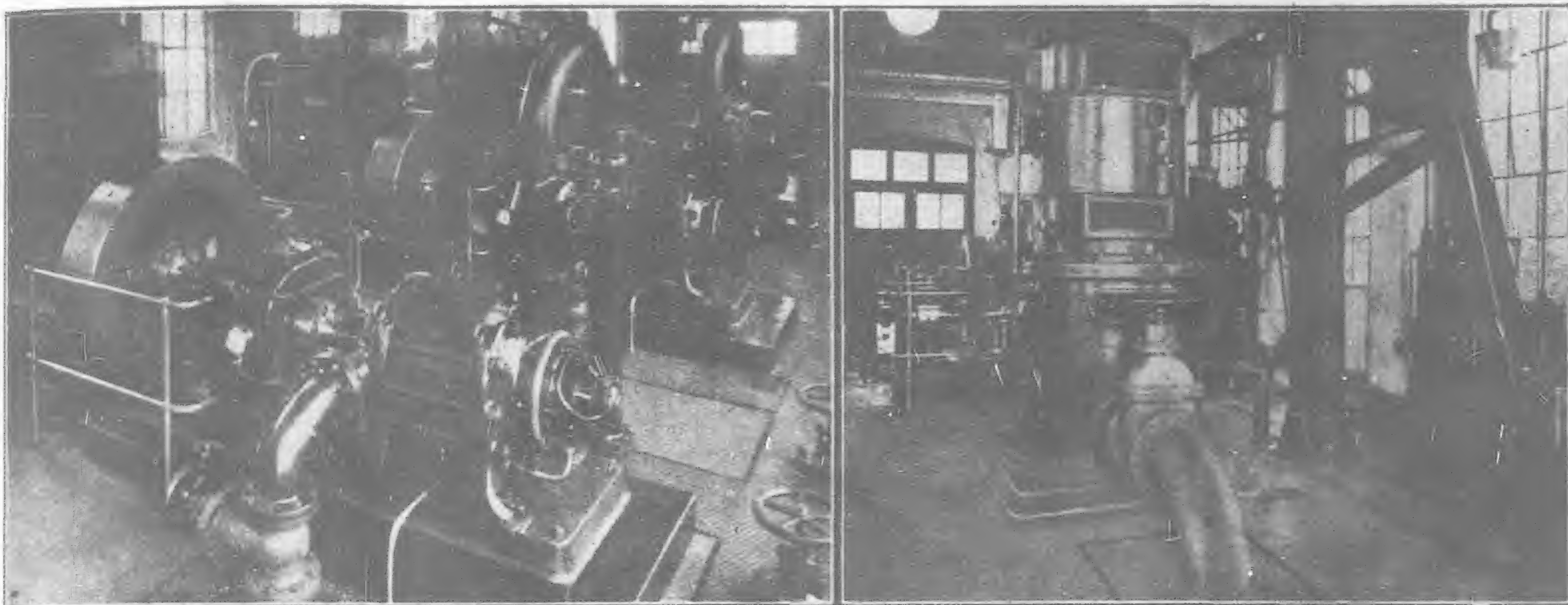
So far as the force pump units are concerned, these each comprise a three-cylinder Allen four-stroke cycle, trunk-piston, airless-injection engine driving an Allen 5-in. Conqueror type pump through D.B.S. speed-increasing gearing. The main characteristics of the two sets, which are identical, are as follow: The bore and stroke of the engines is 230 mm. and 300 mm., respectively, and each develops 90 b.h.p. at 450 r.p.m. The engines have Bosch fuel injection equipment and chain-driven camshafts. This speed is increased to 1,410 r.p.m. for the pump spindle by means of spur increasing gearing, supplied by David Brown & Sons (Huddersfield), Ltd. These gears are of the totally-enclosed type, with forced lubrication, and they have proved to be remarkably quiet in operation. Each force pump is designed for a duty of 31,250 gallons per hour with a discharge pressure of 150 lb. per sq. in., the equivalent head being 346-ft. The pump efficiency (w.h.p./b.h.p.) is 78 per cent, the b.h.p. at the pump coupling being 70, and that at the engine coupling 73. It is interesting to note that the specific fuel consumption of these engines at full pump load is 0.390 lb. per b.h.p. per hour, while the fuel per w.h.p. per hour is 0.521 lb., both being very good results.

The engine which drives the Allen generator for supplying current to the borehole pump, is similar to the force pump engines, but has four cylinders, instead of three; the bore and stroke are, however, the same. The engine has a B.E.S.A. rating of 130 b.h.p. at 485 r.p.m., and the full load specific consumption is 0.39 lb. per b.h.p. per hour, which figure is also obtained at three-quarters full load. The engine is directly-coupled to a dynamo having a B.E.S.A. rating of 80 kw. This machine is an open type compound-wound interpole generator, and the voltage is 220.

The borehole pump, which was also supplied by the Bedford firm, has an internal diameter of 36-in., and is directly-driven by a direct-current motor of Allen make. The duty of the pump is 62,500 gallons per hour, and the static lift below surface is 150-ft., while the total head, including friction, is 155-ft. The pump efficiency, i.e., w.h.p./b.h.p., is 76 per cent, and the b.h.p. at the pump coupling is 64.3, while the gross b.h.p. is 71.3. The approximate r.p.m. of the pump is 1,050, and the driving motor is of the vertical enclose, ventilated, drip-proof type, with a B.E.S.A. rating of 83 b.h.p. The voltage is 220, and the speed range 680/1,110 r.p.m. The control gear for the motor consists of an Allen drum-



General arrangement of Batchworth Diesel-Equipped Pumping Station of the Rickmansworth and Uxbridge Valley Water Company



Two views of the Batchworth Pumping Station showing Diesel-driven Force Pumps and Generator (left) and (right) the Allen Borehole Pump

type starter, with no-volt and overload release, isolating switch, shunt regulator, and ammeter. The switchboard was also supplied by Allens. Filtered water is fed to the lignum vitae bearing of the borehole pump, duplex filters allowing of filter cleaning to be performed while the pump is running. The depth gauge for the borehole pump was supplied by the Cambridge Instrument Co., Ltd.

The layout of the station is excellent, there being adequate floor space between the sets for overhauling, while two overhead cranes, by Herbert Morris, of Loughborough, are provided, one being installed for serving the borehole pump and the other for use on the Diesel sets. The cooling water arrangements are straightforward and neat, an Allen motor-driven circulating pump drawing from the balancing tank and raising the water to an overhead tank in the power house, whence it passes into a common cooling water main along the front of the engines. Valves are provided at the engines to regulate the individual supplies. The lagged exhaust pipes are carried through the wall to separate silencers arranged outside the house at ground level; a fuel oil heater is incorporated in each exhaust pipe. Allen fuel and lubricating oil filters are provided on the front of each engine, these being adjacent to the Smith tachometer, with which each engine is provided. Mercury thermometers are provided in each exhaust branch, these being so placed that the attendant can easily see the exhaust temperature of any cylinder.

Fuel is contained in two outside steel storage tanks, each of 6,000 gallons capacity, these tanks having been supplied by Davies Bros. & Co., Ltd., Wolverhampton. Each tank is fitted with an oil-flow meter at the base, these having been supplied by George Kent & Co., Ltd., Luton. Each engine has its own overhead daily service fuel tank inside the station, a hand pump, distributor, and Kent oil meter being arranged against the wall below one of the tanks. The Venezuelan fuel oil used in the station, incidentally, is supplied by Berry & Wiggins, of Rochester. As is shown in one of the illustrations, a Stream-Line lubricating oil renovating equipment is installed in the station close to the cooling water pump. This filter plant

is the Stream-Line Filter Company's 019 size, and is provided with electrical heating elements. The lubricating oil at present being used in the Batchworth engines is supplied by the Vacuum Oil Company, Ltd. Starting air is stored in two riveted steel reservoirs, the compressor set being nearby. This has been supplied by the Hamworthy Engineering Co., Ltd., and consists of a Hamworthy petrol-paraffin engine and Hamworthy compressor, both being mounted on a common base.

When we visited the Batchworth station in December, 1931, one force pump and the generating set and borehole pump were running. The engines were running very sweetly and quietly, and the exhaust of both was almost invisible. There was no noticeable vibration in or near the power house, which is only about fifty yards from the main road, where, incidentally, the engines are almost inaudible.

The well pump is regulated to synchronize with the delivery of the force pumps by hand control at the switchboard. The borehole pump capacity is at the rate of 1,500,000 gallons per 24 hours, and the force pump delivery is in two units of 750,000 gallons per 24 hours to either Heronsgate Reservoir, T.W.L. 420-ft. A.O.D., or to Harefield Reservoir, T.W.L. 330-ft. A.O.D., or both can deliver simultaneously to either reservoir. This arrangement forms a very flexible one, as the lower level can be throttled to deliver the exact quantity required at Harefield with the remainder going to Heronsgate reservoir. Mr. James Grimmett, the engineer and manager of the water company, says that the guaranteed fuel consumption has been maintained throughout the pumping within 5 per cent of Allen's guarantee, notwithstanding that the plant has been running light and one pump only has been sufficient for the winter load. The whole plant, he reports, has worked smoothly and well since it was started up in the first week in November, 1931. The lubricating oil consumption is equal to about one pint per day per engine, and is changed by means of a hand pump once each week into a dirty-oil tank 10-ft. above, and passed through the Stream Line filter under a head of about 10-ft.

Chinese Steel Works

Present plans provide that the proposed Central Iron and Steel Works of China will commence operations at the latest by next spring, according to Mr. Liu I-yen, who is in charge of preparations for the establishment of the enterprise.

Funds for this project, sponsored by the Ministry of Industry, will be obtained in part from the British Boxer Indemnity Refund by a loan of £123,000 sterling.

According to plans, the sterling loan will be devoted exclusively to the purchase of necessary equipment for the factory. Another

loan of \$100,000 will be obtained for the acquisition of land and the construction of factory buildings. All loans will be secured on the Mining Tax during the first three years; the Works itself will undertake payment of interest and redemption of principal thereafter.

A piece of municipal land of about 200 mow in area at Hsia-kwan having been selected as the site of the Works, building operations will begin in the near future. Deputies will be sent to England shortly in connection with the purchase of machinery.—Kuo Min.

Potentialities of the Chinese Market for Road-making Machinery

Trade Commissioner A. VIOLA SMITH, Shanghai

THE introduction of road-making machinery into China for highway construction has been extremely slow. The high initial cost of such equipment has militated against its use in a country financially hard pressed and with an abundance of cheap mass labor. Until three years ago the only road-making equipment to be found in the country—with the exception of a few steam road rollers—was that owned and operated by the various public works departments of foreign concession areas in the larger treaty ports. But within the last two years a beginning has been made in the use of road-making machinery by Chinese authorities responsible for highway construction.

The slump in silver exchange has greatly retarded the initial impetus created by demonstrations for road-building machinery. So long as silver exchange remains at its present level (which requires two and one-half times more silver to purchase gold than normally), no great expansion can be expected. But a beginning has been made. Given better exchange conditions and persistent sales campaigns, the use of modern road-making equipment is certain to occupy a leading position in China's future economic development.

Highway Construction Important

The importance of highways in the economic development of China can not be gainsaid. Many experts who have studied the present transportation facilities of the country feel that highways, owing chiefly to the necessity of eliminating huge expenditures, should, and will, take precedence over railway building.

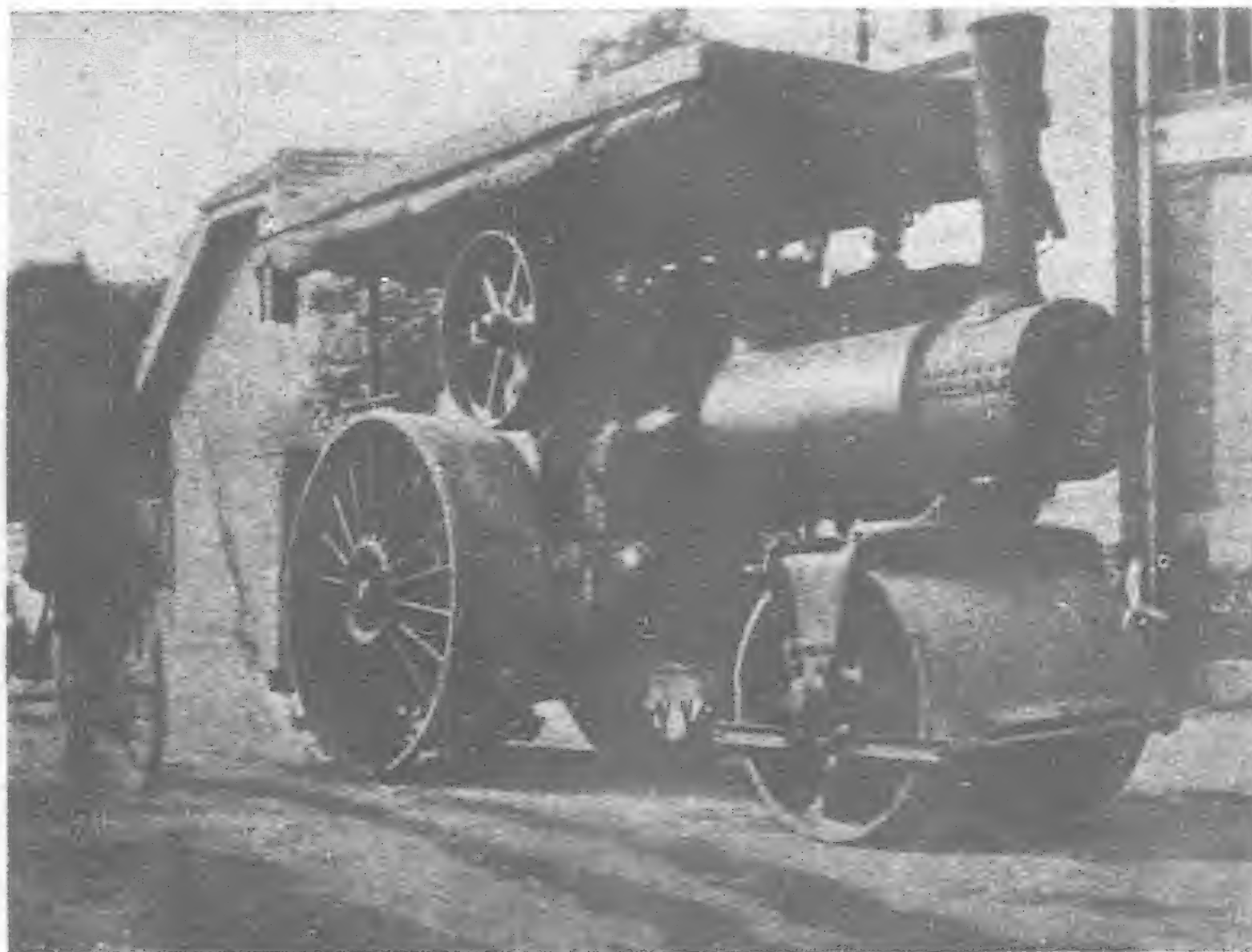
China's highway development is under the jurisdiction of the various provincial authorities, and although the National Government has formulated a paper plan for national highways, the building thereof has been left to the Provinces. Eventually, some sort of central government or federal-aid system may be worked out, but with the difficulties which the National Government has in securing funds, and the many demands upon the National treasury, it is believed that the establishment of a federal-aid highway fund will not materialize for some time. Moreover, the limited financial resources of the provincial authorities increases the importance of coolie labor as a competing factor against machinery in the construction of highways. Chinese authorities are beginning to realize the potentialities of road-building equipment for the maintenance of highways after they have been built by manual labor. Thus, highway authorities are searching for economic means of maintenance, and are more responsive to the possibilities of road-making machinery for this purpose than they are for the original construction of roads. Consequently, emphasis on the need for maintenance equipment in China may have more immediate results than the initial building of highways by machinery.

Although complete returns covering the amount and types of road-making machinery in use in the various Provinces of China are not available, it is believed that a conservative estimate would include the following: 150 road rollers; 30 graders, scrapers, scarifiers, rippers, etc.; 15 rock crushers; 12 concrete mixers; and 50 road-building tractors.

Exports of Road-making Machinery from the United States to China

Exports of strictly road-making machinery from the United States to China (including Hongkong and Kwantung) in 1931 and 1930, respectively, were valued at \$22,225 and \$27,352, comprising in the respective years: Road rollers, one valued at \$450, and six valued at \$9,396; road graders, eight valued at \$9,119, and 10 at \$7,931; other road-making equipment valued at \$12,656, and at \$10,025.

In addition to the items listed, other types of machinery used in road construction, and which can be included in this survey, included \$22,840 worth of dredging machinery in 1931, as compared with \$485 in 1930, and two concrete mixers with an aggregate value of \$4,524, in comparison with six mixers valued at \$9,456. In addition, exports of excavators and parts from the United States to China totals \$204,000 in 1930 and \$139,000 in 1931.



American Steam Roller in use in Mukden

Competitive Factors

The above figures indicate that efforts on the part of American manufacturers to develop an outlet for their products in China are still in the pioneering stage. Keen competition is encountered from German and British products, and orders placed in the United States will have to be persistently followed up before any large volume of business in this line will come of its own accord. No accurate gauge of the extent of total importations of road-making machinery is obtainable, as the Chinese Maritime Customs Returns of Trade do not separately classify this item. Generally speaking, it may be said that Germany leads in the trade for steam and Diesel road rollers, with Great Britain taking second place. Though a few American road-rollers have been marketed in China, the United States has not shared to any great extent in the trade in this item. However, the United States leads all other countries as the leading supplier of road graders, scrapers, scarifiers, etc., and it is hoped that steps will be taken to maintain this position. Not only does the introduction of modern machinery into China require a strenuous sales effort, but the utilization of such machinery after purchase is of paramount importance to repeat business. There are numerous instances where initial purchases of road-making machinery have been allowed to idle and rust away after the first novelty of use wore off.

Overhead Electricity Transmission*

Advantage of Steel-Cored Aluminium Conductors

THE pictures accompanying this article reveal part of the story of the tremendous development of the use of aluminium for overhead transmission of electricity. In Japan, as the map shows, the resources for hydroelectric power have been extended to a very remarkable degree, and as the conductors employed on the bulk of the transmission lines are of steel-cored aluminium, the illustrations, together with some typical line details, have been incorporated in a handsomely illustrated booklet issued by the British Aluminium Co., Ltd., which deals with lines on which the aluminium employed was provided mainly by the company. The pictures were supplied to the British Aluminium Co. by the operating companies in Japan and the Furukawa Electric Co., and we in turn are indebted to the British Aluminium Co. for the loan of the blocks.

The booklet shows that steel-cored aluminium conductors are now installed in every quarter of the globe and under all conditions of operation. Even in systems abroad which have not been engineered from Great Britain or in which materials have been obtained from other sources of supply than that of the British Aluminium Co. it is shown that the British trend has its counterpart.

The compiler of the booklet states in a foreword that twenty-five years ago copper was the only material seriously considered for overhead line conductors; aluminium, either as a solid wire or plain stranded material, had been used in some instances, but such cases were unusual and looked upon as a somewhat daring departure from standard practice. To-day the position is reversed, and steel-cored aluminium is adopted for the majority of all new schemes of importance in every country of the world.

Continuing, he says: Though steel-cored aluminium shows to its greatest advantage for high voltage long distance transmission, it is equally employed for schemes of all kinds, for the distribution system for rural development as well as for the most important long distance transmission schemes in existence.

The reason for this universal adoption of steel-cored aluminium can be traced to the following facts:—

Steel-cored aluminium conductors are considerably cheaper than copper conductors of equal resistance (the percentage economy depending upon market conditions and other factors), and this in itself is, of course, a strong argument for their use. Given that economy is obtainable without sacrifice of efficiency, of reliability, or of length of useful life, the choice will naturally fall on the cheaper material; but this does not completely explain the rapid adoption of steel-cored aluminium, and the difference in price, though substantial, by no means represents the sum total of advantage obtainable by the substitution



Yodogawa Crossing of 154 k.v. line Nihon Denryoku K.K.

of steel-cored aluminium for copper. Steel-cored aluminium is definitely superior from the technical standpoint, in that it is over 50 per cent stronger and about 20 per cent lighter, and, as a result, the allowable sag in the conductors of an overhead line will be considerably smaller.

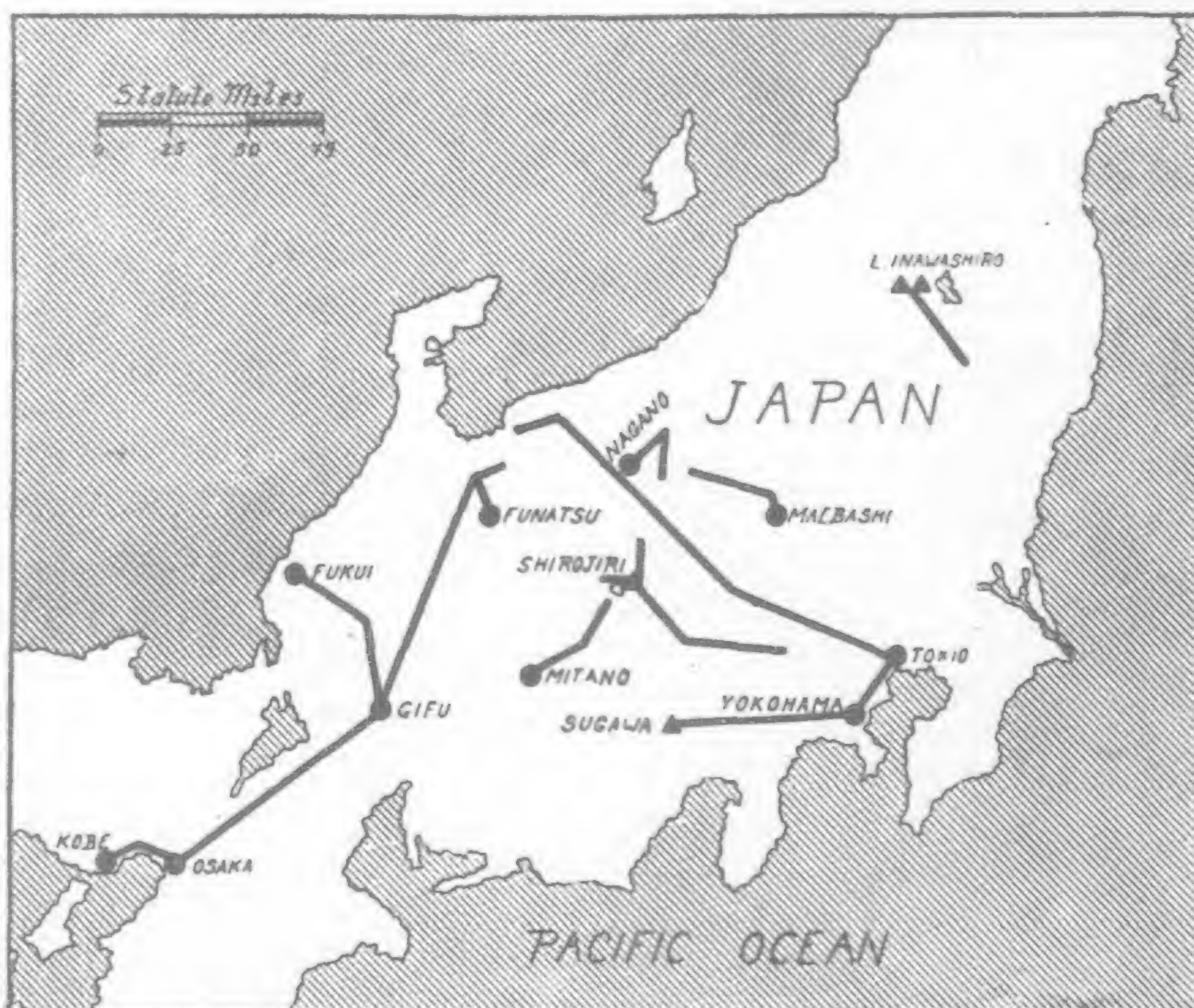
For example, a copper conductor of 0.15 sq. in. section, erected on a 600-ft. span length, with a factor of safety of two under a load of $\frac{3}{8}$ -in. ice, plus 8-lb. per sq. ft. wind pressure at 22 deg. F., will have a sag of a little over 14-ft. at 122 deg. F. in still air. Under the same conditions, the sag with steel-cored aluminium will be just over 7-ft., and in consequence the supports for steel-cored aluminium conductors can be 7-ft. shorter without reducing the ground clearance.

A much more satisfactory method of taking into account the superior mechanical characteristics of steel-cored aluminium, however, is to increase the span length. In the example we have already cited, it would be possible to use steel-cored aluminium conductors on a span length of 825-ft. without necessitating a higher support than with copper on the 600-ft. span, and by this means the total number of supports is reduced by 27 per cent. The individual supports would be more costly for steel-cored aluminium, because, although the height has remained unaltered, the loading has increased; but the increase in individual cost is not

sufficient to neutralize the effect of the reduction in the number, and the economy on the conductors would be supplemented by an additional saving on the total cost of supports.

In addition, the 27 per cent reduction in the number of supports involves a corresponding reduction in the total cost of insulators, foundations, erection, and wayleaves, and incidentally the costs of maintenance, replacements and stores are similarly reduced. It is not too much to say, therefore, that the use of steel-cored aluminium provides economy on every item of line cost.

The increase in span length is beneficial in another way. It is well known that the vast



*Eastern Engineering and Commerce.

majority of shutdowns in the operation of an overhead line arise at points of support, due to faulty insulators, troubles with birds, and so on. Hence a reduction of 27 per cent in the number of points of support will correspondingly reduce the risk of stoppages.

In permitting the use of long span lengths, therefore, steel-cored aluminium leads to a greater reliability in operation, but even in the case where the span length is not increased, the use of the stronger type of conductor adds to the reliability of the line. A steel-cored aluminium conductor of breaking strength 15,000-lb. provides a greater margin against abnormal loads than a copper conductor of breaking strength 10,000-lb., even though both are erected with the same factor of safety; for with copper, if the working load is 4,000-lb., i.e., a factor of safety of $2\frac{1}{2}$, there is a margin of 6,000-lb. between this and the breaking load to take care of abnormal conditions, whereas with steel-cored aluminium with the same factor of safety, the working load would be 6,000-lb., and this is 9,000-lb. less than the breaking load.

Among other advantages of steel-cored aluminium, mention



154 k.v. S.C.A. and 115 k.v. Copper lines running parallel on Tokyo Dento K.K. Scheme. Note Longer Span Lengths with Steel-Cored Aluminium Conductors

must be made of its higher corona limit, a point of vital importance with high voltage lines, and the lower handling charges and greater ease of erection arising out of its lighter weight.



Sasazu Substation of Sasazu-Funatsu 154 k.v. line

Radio in Japan

The Japan Broadcasting Association celebrated the occasion when it recorded one million subscribers through the country. Paying subscribers exceeded one million on the February 16 with the following distribution through the country.

Kwanto district, JOAK	...	...	439,817
Kwansai district, JOBK	...	...	318,450
Tokaido district, JOCK	...	...	109,717
Chugoku district, JOFK	...	...	36,657
Kyushu district, JOHK	...	...	44,142
Tohoku district, JOHK	...	...	30,920
Hokkaido district, JOIK	...	...	20,557

Total 1,000,260

Minerals in Kiangsi, China

Sihuashan is situated outside the city of Tayu, formerly Nanan, in the province of Kiangsi. During the European war this place was known as a great center for tungsten ore, and its importance may be compared with the Yaokangsien mining district of Tsehsing Hsien, Hunan province.

At the time of the great war the price of tungsten was \$70 per picul, or about \$1,120 a short ton, but the present price is about \$13 per picul or \$208 a short ton (Mexican dollars=2s. 4d. each).

The most important mineral found in the Sihuashan district is wolframite, which is found in quartz veins associated with pyrite, molybdenite, bismuthinite, bismuthite, graphite and biotite. These veins are almost vertical, trending in a E.-W. direction, and their length may extend to half a kilometer or more, with a width of from a few centimeters to two meters.

In its most prosperous days, the Sihuashan mining districts had 10,000 laborers at work, against the thousand or so at present employed. The daily output of tungsten ore at Sihuashan is from 20 to 30 piculs; at Sun Lung Kow (which is situated about seven kilometers northeast of Sihuashan), 20-30 piculs, at Piao Tang, about seven piculs. The total production of tungsten ore for the whole district is about 50 or 60 piculs, or four short tons a day. The output of tin ore is about one-tenth of the amount of tungsten ore. The output of bismuth and molybdenum ore is irregular, and prices also vary greatly.—*Chinese Economic Bulletin*.

A Jupiter in China

Some months ago Messrs. Vickers (Aviation), Ltd., sent a Vickers Vespa-VI army co-operation aeroplane to China for demonstration purposes to the National Government. The pilot has now returned and has stated that the "Bristol" Jupiter-VI.F engine has behaved very satisfactorily under trying conditions; an extract from his report follows:—

"This engine has behaved in an exemplary manner, both in England and China, and has proved eminently reliable, smooth running, and flexible in control.

"It must be remembered that, although the actual flying times are small, each flight has consisted of a definite job of work, which has imposed a severe test on the engine, such as would probably occur only in some ten times the number of flying hours under normal service conditions, and further it must be clearly understood that for seven months in China the machine and engine were picketed out in the open and subject to somewhat rigorous climatic conditions.

"Despite these disadvantages, the engine has functioned perfectly on all occasions, and is one of the most satisfactory engines I have encountered for some time."

Certainly, being picketed out for seven months must be regarded as rather severe on both engine and aeroplane, and obviously only really good engines and aircraft could be subjected to such treatment without troubles arising.

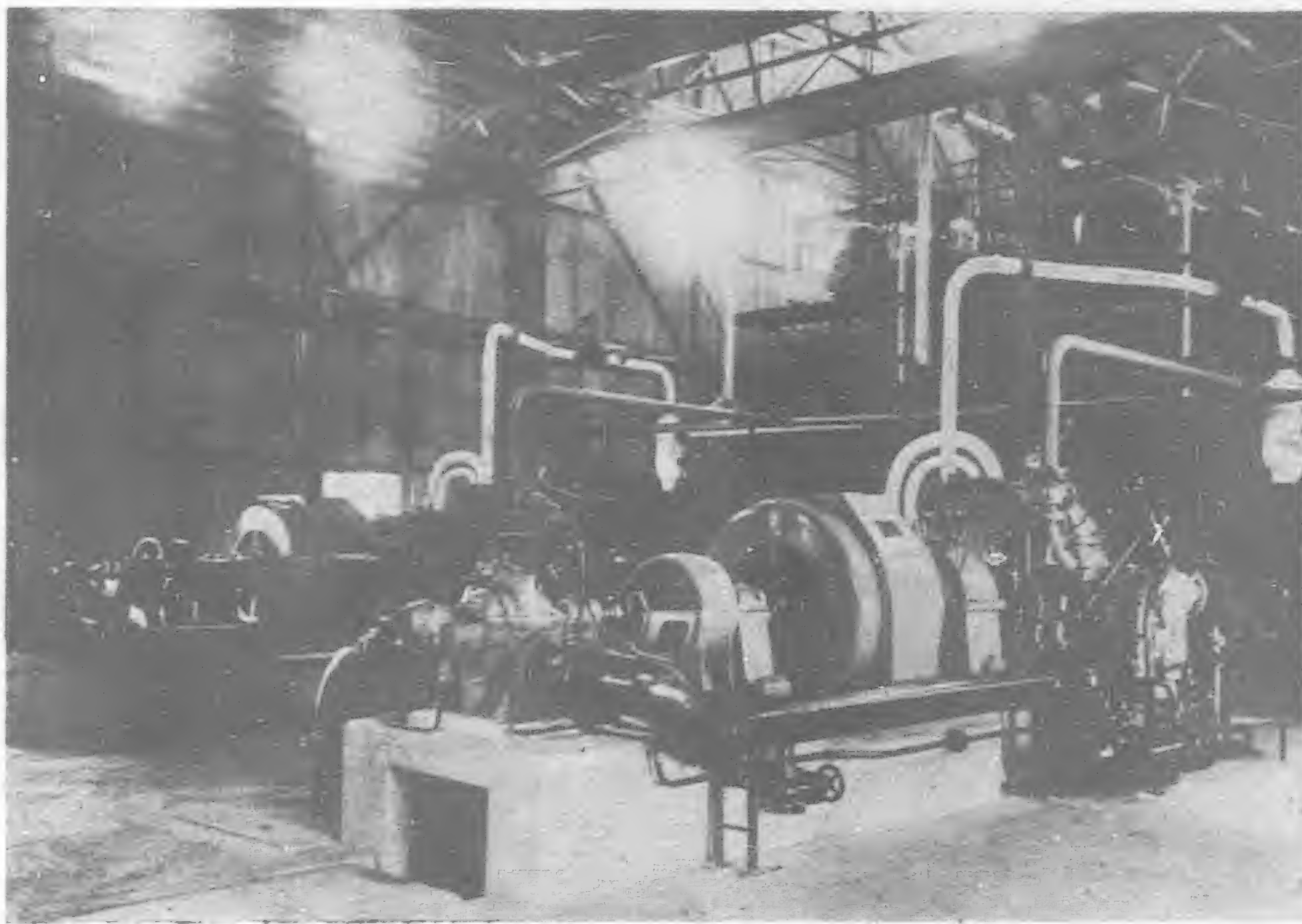
Bombay-Burmah Trading Corporation Buys Machinery

THE illustration shows two Metropolitan-Vickers' Self Contained Turbo Generator Sets installed at Dunneedaw, Rangoon, for the Bombay-Burmah Trading Corporation. A third entirely similar unit is on order and in course of manufacture, the additional power being necessary in view of the undertaking to supply current to adjacent works, but the bulk of the supply will be required by the saw-mills of the Corporation.

The sets are each of 550 kw. maximum continuous rating and are designed for steam conditions of 200 lb./sq. in. gauge 200 degs. F. superheat, the speed being 6,000 r.p.m. The turbines are coupled through single reduction double helical gearing to alternators running at 1,000 r.p.m. and designed for 3 ph. 50 period, 400-volts.

The condensers, which are of the surface type, are formed integral with the turbine exhaust casing, and each has a cooling surface of 422 sq. ft. Both circulating water and condensate extraction pumps are mechanically driven from the main sets, the former by an extension of the generator shafts and the latter by a downward extension of the governor spindle. The ejectors, which are of the two-stage type, are mounted on the inlet circulating main with the coolers arranged in the water flow.

Sets of this type are capable of very rapid starting up and of easy control while a complete absence of separately driven auxiliaries makes for maximum simplicity and overall efficiency.



Two Metropolitan-Vickers Self Contained Turbo Generator Sets installed at Dunneedaw, Rangoon for the Bombay-Burmah Trading Corporation

These sets were ordered by Messrs. Wallace Brothers & Co., Ltd., of London, who are Agents in this country for the Bombay-Burmah Trading Corporation.

Metrovick self-contained turbo-generating sets can now be obtained in outputs ranging from 200 kw. to 5,000 kw.

Indicating their wide popularity, since first developed by the Metropolitan-Vickers Electrical Co. about four years ago, they have to-day found application in some 20 different industries situated both at home and overseas.

Gold Prospecting in Pahang

REFERRING to a recent reference to a miniature "gold rush" in Pahang, Mr. F. G. W. Dunsford, A.INST.M.M., writes to the *Malay Mail*:—"The area of 200 square miles of country between the Lipis and Jelai rivers north of Raub and west and south of the town of Kuala Lipis is not dead level and one vast patch of gold bearing alluvium, but can best be described as a belt of auriferous low undulating country traversed by innumerable sluggish streams in the beds of which in most cases alluvial gold is to be found, just as alluvial tin is to be found in most of the stream beds on the western side of the main range. As in many other parts of Pahang, there is evidence of most extensive old workings, the methods employed by the early miner being ground sluicing (lampanning) on the higher ground and shafting in the valleys.

Within this belt of country gold bearing reefs were opened up and worked by European mining and exploration companies in the past, and it is said that the cause of failure was not the want of gold, so these mines, Selensing, Buffalo Reef, Chaping and Punjom should be heard of again and no doubt more reefs will be found and opened up. The Buffalo Reef is described as a big strong ore body containing over an ounce of gold to the ton but also containing a lot of antimony (stibnite), which latter evidently frightened the previous owners, as the machinery equipment for the mine was never erected and to this day lies half buried in river silt at Kuala Medang about three miles away. It must have cost at least \$300,000.

"It has been often said that it will not pay to work the alluvial gold in Pahang by modern methods, but I have definitely proved by boring that payable ground exists," adds Mr. Dunsford. "What I mean by payable ground is that ground which will pay dividends of 20 per cent and over on the capital invested. Ground which I have recently bored has shewn gold values in several individual bores of \$2 per cubic yard from top to bottom. An average of 25 cents per cubic yard will pay good dividends for bucket dredging, and the dredges will go into Pahang as soon as big enough yardages are

proved to warrant their installation. One thing that prospectors in Pahang can depend on, and that is that they will get every possible assistance from Government officials. This has been my experience so far."

The question of the presence of antimony, mentioned above, is no longer of such importance, according to the *Engineering and Mining World*, which in a recent issue said: "Advices from Johannesburg indicate the successful outcome, on a laboratory scale of a new method for the recovery of gold from the stibnite ores of the Murchison range, in which process amalgamation plays an important rôle. A concentrated product shows no free gold. After roasting in contact with a mixture of chemicals obtained as by-products of a local industry, however, bright gold is liberated, which can be readily amalgamated. The tailing after amalgamation is treated for the recovery of antimony, either as oxide or metal. By the new process which is sponsored by Ferro-Alloy Proprietary, Ltd., recoveries of 90 and 80 per cent of gold and antimony, respectively, are said to be feasible. A continuous process pilot plant is being designed, where the laboratory development can be extended and applied on at least a semi-commercial scale. The association of arsenic with antimony has been partly responsible for the difficulty in treating gold stibnite ores. Straight cyanidation invariably failed. Cyanidation after roasting gave low recoveries.

A process involving the volatilization of the antimony promised success but results failed to meet expectations. Flotation of a complex ore of this character has given excellent results, but such concentration is merely the preliminary phase of a recovery operation. The new process promises a high recovery of gold by a simple mechanical method after a metallurgical roast. If successful on an operating scale, more attention will be deflected to an improvement in the technique of the old process of amalgamation as a working metallurgical tool."



The Dredge "Margaret"

The Dredge "Margaret"

For the Indo Burma Petroleum Co., Ltd., Rangoon, Managing Agents Messrs. Steel Bros. & Co., Ltd.

IN the neighborhood of Lanywa on the Irrawaddy River, there are valuable oil bearing lands which are actually under the river bed or adjacent to it. During the monsoon which lasts for about five of the summer months, the Irrawaddy rises each year to a high flood level and the adjacent land becomes flooded. A serious problem is, therefore, presented in attempting to put down oil wells to recover the oil.

It was finally decided to build a bund to cut off the river from the actual ground it was desired to drill and this work was done two or three years ago by means of a large Bucyrus Erie Class 20 Dragline. The original bund has proved successful in withstanding the river in the flood season and is now being further extended by the same means.

Having built the bund and shut-off the force of the river from crossing the land, there still remained the problem of the flood waters collecting behind the bund, during the monsoon and so preventing work being done except at heavy cost for well foundations. There was only one solution and that was to fill in the ground behind the bund to a sufficient height to be above flood level. Two methods of doing this were considered, the first being to hydraulic earth from neighboring higher ground to the required spot, the second, and the one adopted, being to use a suction dredge and pump the material from out of the river bed itself over the bund on to the flat behind it. Quite a large amount of filling is required and after investigation of the various possibilities, the Indo Burma Petroleum Company decided that the most economical solution was to purchase a suction dredge, specially designed for this work, capable of large outputs and low working costs.

The dredge was supplied by Messrs. Bucyrus Erie Company of South Milwaukee through their associate Company, Messrs. Ruston Bucyrus Limited of Lincoln, England, who are represented in Burma by Messrs. William Jacks & Co. The actual hull was built in Rangoon by The Irrawaddy Flotilla Company. The dredge was completed in their yard in Rangoon, all machinery units installed aboard under the supervision of Mr. E. P. Hayward, the Erecting Engineer of the Suppliers and has now completed the journey up the Irrawaddy River to Lanywa and gone into steady work.

The dredge has a number of interesting and unusual features expressly incorporated for a reasonable initial first cost and exceptionally low working costs. The diameter of the suction pipe is 18 inches, the discharge pipe being 16 inch diameter. The suction pipe is suspended from the front of the dredge and is of sufficient length to permit of working down to a depth of 40-ft. below water level. In place of a cutter head, the suction pipe terminates in a nickel chrome steel casting with a special suction mouth arranged to direct a powerful jet of high pressure water on to the ground to be dug and to guide it into the suction mouth. The alluvial silt of the Irrawaddy is free-running material, eminently

suitable for disintegration by this method which obviates the more usual type of revolving cutter head, together with its driving gear, while giving even better results in the class of material to be dug.

In place of the usual trunnion joint connecting the outboard suction pipe to the fixed inboard pipe, which is a frequent source of trouble on suction dredges, a 10-ft. length of armored and reinforced flexible rubber piping is used to make the connection. The pump is of large diameter the casing consisting of a single piece unlined nickel chrome annealed steel casting, having a thickness up to 3½ inches in the zone of greatest wear.

The impeller, which is 5-ft. 8-in. in diameter is also a massive nickel chrome steel casting with four vanes. The pump is direct-connected to an eight cylinder solid injection 4-stroke diesel engine rated 670 b.h.p. at 300 r.p.m. The connection between engine and pump goes through a flexible coupling of the friction disc type which can be adjusted to slip to protect the engine from serious overload.

All other mechanical units on board the dredge are electrically operated from electricity generated by a diesel electric set whose engine is rated at 168 h.p. These units include the pump for high pressure water at the nozzle already mentioned. The motor for this service is of 50 h.p. There is also a service pump driven by a 20 h.p. motor while the winch, consisting of five drums with various lines controlled through clutches and brakes for swinging and moving the dredge and also for raising the spuds, is operated by a 15 h.p. motor. There are additional various small motors for driving circulating water pumps and radiator fans.

The hull of the dredge consists of a box-shaped pontoon approximately 100-ft. long, 34-ft. wide and 8-ft. deep. The draught in working order is approximately 4-ft. While digging, the dredge is held in position by heavy steel spuds, two of which are located at the stern of the dredge, spaced about 12-ft. apart. The spuds are 27-in. diameter, 65-ft. over-all length. While working one spud only is lowered and the dredge is pivotted on this spud by side lines which pass round sheaves fixed to either side of the suction head. To move the dredge up the second spud is dropped at one end of the cut and the other spud lifted. When pivotting commences on the second spud the suction head makes a fresh cut. By these means even cutting can be obtained and an equal distance moved up for each successive cut. The spuds are also very valuable for holding the dredge in a strong current.

The side lines for swinging, of course, have to be taken out to buoys or "dead men" suitably placed. The discharge pipe passes over the stern of the dredge to a steel pipeline floating on a steel pontoon and provided with ball joints for flexibility.

The dredge has been conservatively rated to pump clear water at 12-ft. per second through 2,000-ft. of pipe-line with a lift of 38-ft. above water level to be negotiated.

M.A.N. Double-acting Airless-injection Engine

Versus

Mitsui-B. & W. Single-acting Supercharged Solid-injection Engine of the Same Output of 6,000 b.h.p.

Comparison of Propelling Machinery of New Fast Cargo Motorships "Kirishima Maru" and "Katsuragi Maru"

By Y. TAJI, M.I.N.A., M.I. Mar. E.

THE recent remarkable development of the Japanese motor-shipbuilding has offered to marine engineers, shipbuilders and owners very valuable materials for the practical solution of various difficult problems in connection with the design, construction and performance of ships and machinery of various types.

Despite the unprecedented world-wide depression Japan enjoyed incidental temporary prosperity in shipbuilding—though it has now vanished—in consequence of new construction programs of her leading shipping companies for building a number of motor liners of the same size and power, but equipped with Diesel engines of different types or makes. For instance the Trans-Pacific Motor Passenger Liners *Asama Maru*, *Tatsuta Maru* and *Chichibu Maru* of the N.Y.K. Line have very similar tonnages and the same design s.h.p. of 16,000, the first two being equipped with four sets of Sulzer single-acting engines whilst the third has two sets of B. & W. double-acting engines.

The cargo motorships *Soyo Maru* and *Ryoyo Maru** of the Toyo Kisen Kaisha, Ltd. are of the same gross tonnage of 6,000 tons propelled by Sulzer and M.A.N. engines of 3,200 b.h.p., respectively. Motor vessels *Kanan Maru* and *Kahokuma Maru*, and motor vessels *Santo Maru* and *Sansei Maru*,† recently built for the Dairen Kisen Kaisha, Ltd., are of exactly same size and tonnage, but the first two are propelled by Sulzer engines whilst the other two are equipped with B. & W. engines of the same output.

The most interesting cases may be, however, two latest express cargo motor liners *Kirishima Maru* and *Katsuragi Maru*‡ of the Kokusai Line, both being of the same design, tonnage and power. The former is propelled by one set of M.A.N. two-cycle double-acting airless-injection engine, whilst the latter is equipped with a Mitsui B. & W. four-cycle single-acting solid-injection super-charged engine which is the world's largest unit for the four-cycle single-acting type.

(I). THE PRINCIPAL PARTICULARS AND LEADING CHARACTERISTICS OF THE SHIPS AND MAIN ENGINES

TABLE I.

Particulars of Hull.	<i>Kirishima Maru</i>	<i>Katsuragi Maru</i>
Length over-all	466-ft. 0-in.	do.
Length between perpendrs ..	440-ft. 0-in.	do.
Breadth moulded	60-ft. 0-in.	do.
Depth moulded	40-ft. 0-in.	do.
Draught, fully loaded	26-ft. 1.21-in.	26-ft. 3.16-in.
Displacement, tons	14,110	14,140
Gross tonnage, tons	5,959.01	5,840.55
Net tonnage, tons	3,552.85	3,485.15
Under deck tonnage, tons ..	5,371.15	5,238.27
Dead weight, tons	8,742.53	8,672.26
Cargo capacity, grain—cub. ft.	628,309	622,439
Cargo capacity, bale—cub. ft.	579,488	562,550
Rato, L/B.	7.33	7.33
Rato, L/D.	11.00	11.00
Trial speed, knots	18.029	17.75
Sea speed, knots	16.0	15.75
Classification, Lloyd's ..	✱100A1 with L.M.C.	do.

Particulars of Main Engines

Number of engines	1 set.	do.
Type	M.A.N. two-cycle, double-acting, airless-injection Diesel, D7Zu70/120.	Mitsui-B. & W. four-cycle, single-acting, airless-injection, super-charged Diesel, D.E.1074-TF-150.
Engine-builders	Maschinenfabrik-Augsburg-Nurnberg A.G. Germany.	Mitsui-Tama Works, Japan.
No. of cylinders	7	10
Bore in mm.	700	740
Stroke in mm.	1,200	1,500
B.H.P. (normal)	6,000	6,000
R.P.M. (normal)	95	115
B.H.P. (trial)	6,971	6,703
R.P.M. (trial)	104	126

(II). DIFFERENCE OF MACHINERY DESIGN

(a) The *Kirishima Maru*'s Main Engine—M.A.N. Type :—

In this engine, the cooling of cylinder jackets, covers and piston is effected by fresh water. There are three sets of electric driven centrifugal cooling water pumps with a capacity of 400 cub. meters per hour, a fresh water recoler with a cooling surface of 500 sq.m. and two port service cooling water pumps of electric centrifugal type with a capacity of 30 m. per hour each installed in the engine room, the pumps being supplied by the Atlas Werke of Bremen, whilst the motors by Siemens-Schuckert A.G. near Berlin.

Scavenging air is supplied by a Brown-Boveri's turbo-blower with a capacity of 800 cub. m. per min. at 1.125 kgs. per sq. cm. at 2,200/2,950 r.p.m., this being independently driven by a 220-volts-245 kw. electric motor.

Air compressors are fitted to two Diesel generators and one emergency Diesel dynamo set, the former being of three-stage type of 325 cub. meters per hour at 30 atms., while the latter is of two-stage type of 20 cb. ft. per hour at 30 atms. For supplying starting air to the main engine, two starting air reservoirs are provided, each having a capacity of 12,000 litres at 30 atms. Further, a Diesel dynamo starting air reservoir of 400 litres at 30 atms. and an emergency Diesel dynamo starting air reservoir of 90 litres at 30 atms. are installed in the engine room. All the reservoirs were supplied by M.A.N. Augsburg Works.

(b) The *Katsuragi Maru*'s Main Engine—B. & W. Type § :—

This engine developing 6,000 b.h.p. at 115 r.p.m. with normal load and 6,900 b.h.p. at overload with 121 r.p.m., is considered the largest unit in the world for a single-acting four-cycle Diesel engine adopted with the solid injection system.

* See *The Far Eastern Review*, July, 1931.

† See *The Far Eastern Review*, November, 1931.

‡ See *The Far Eastern Review*, April, 1932.

§ See *The Far Eastern Review*, April, 1932.

The engine comprises two parts of fore and aft groups, each consisting of five cylinders; and between them, a cam shaft and roller chain gear for operating the super-charging blowers are arranged. The Brown's manoeuvring gear is fitted at the port side of the engine casing, whilst on the starboard middle platform are two sets of super-charging blowers of Root's type, which are enclosed in two casings and driven by the crank shaft through the chain gearing.

The characteristics of this engine is in the adoption of solid injection system to such a large unit and of the high pressure super-charging. Fuel pumps are independently fitted to each cylinder in order to annihilate the irregularity in fuel supply and the trouble for adjustment. The super-charging system differs from other systems in principle, that in this engine pressure air is not used for filling cylinders but atmospheric air is drawn in, whilst the pressure air is used only for the scavenging and super-charging operations so as to reduce the consumption of super-charge air and the capacity of super-charging blowers with consequence that the blowers are directly driven by the main engine owing to a great reduction of power required for them. In order to execute such a cycle, special super-charging valves were invented by the builders and after exhaustive tests it was confirmed that the required quantity of super-charge air is only one half that of other systems hitherto introduced, and the power required for driving the blowers is only 4 per cent of s.h.p. of the engine.

The cooling and lubricating systems are as usual in this type of engines, i.e. cylinders by fresh water, pistons by cooling oil, exhaust valves by sea water, while bearings, crossheads, etc., are forced-lubricated.

Apart from the fuel oil injection pumps and super-charging blowers, the auxiliaries directly fitted to the main engine are a 20 ton bilge pump and a 20 ton sanitary pump, both of a plunger type.

(c) Electric generators :—

A reference being necessary hereafter for the comparison of mechanical efficiencies of the installations, a brief description is given here :—

In the *Kirishima Maru* are three main Diesel-generators in the engine room and one emergency Diesel dynamo compressor set on the second deck amidships. Two of the main Diesel generators are directly coupled to a 3-stage compressor and a 230-volt-235 kw. D.C. compound wound dynamo driven by a M.A.N. G6Vu42 type four cycle solid injection Diesel with six cylinders of 290 mm. bore and 420 mm. stroke, developing 350 b.h.p. at 375 r.p.m. The third main generator is a pure Diesel dynamo set of the same capacity but without compressor.

In the *Katsuragi Maru* are three sets of B. & W. 428MTHK-45 type four cycle, single acting, solid injection Diesel engine with four cylinders of 280 mm. bore and 450 mm. stroke, each developing 210 b.h.p. at 300 r.p.m. fitted with a two stage air compressor of 240 c.m. per hour at 25 kgs. per sq. c.m. and 135 kw.-225-v. D.C. compound wound dynamo.

(III). WEIGHT AND SPACE REQUIRED

Weight of the machinery, size of main engines and engine room spaces are given in Table II.

The main engine of the *Kirishima Maru* is about 100 tons lighter than that of the *Katsuragi Maru*, and the total machinery weight is about 120 tons less than the latter, whilst b.h.p. developed per ton of the main engine and of the total machinery weight are 14.45 and 6.55 for the M.A.N. engine, respectively, against 11.6 and 5.78 of the B. & W. engine. So far as the main engines only are concerned, the double-acting two-cycle type gives only 25 per cent more power than the single-acting four-cycle super-charged engine of the same weight, but if the total machinery weight is calculated the gain of the former is only 13.5 per cent.

Special shape of the engine room was necessary for the *Katsuragi Maru* in view of larger over-all length of the main engine due to the number of cylinders, but the total engine room space differs by 100 sq. ft. only and the b.h.p. developed per sq. ft. of the machinery space is 1.735 for the *Kirishima Maru* and 1.785 for the *Katsuragi Maru*. If the increase of height due to the double acting engine and more upper space for the scavenging blower are taken into account, more volume is required for the M.A.N. double acting engine. In fact, actual observation shows that the engine room of the *Kirishima Maru* is rather cramped in comparison

with that of the *Katsuragi Maru*, so the writer understands that two more frame spaces will be added for the engine room of the next new boat powered with a two-cycle engine, which is now under construction for the Kokusai Line.

TABLE II.

Weight (in tons)	The <i>Kirishima Maru</i>	The <i>Katsuragi Maru</i>
Main engine	416.50 (with turbo-blower)	517.80 (with super-charger)
Shafting and propeller ..	92.50	91.12
Auxiliary Diesel generators ..	81.7	85.72
Engine room auxiliaries ..	50.6	51.39
Exhaust gas boiler	19.5	18.71
Tanks and piping in engine room	91.8	89.47
Spare gears	46.86	48.32
Air bottles	24.58	22.00
Funnel, grating, floor, vents, lifting gear, etc.	92.11	114.27
Total (exclusive oil and water in system) ..	916.15 Tons.	1,038.80 Tons.
Size of Main Engine (in mm.)		
Over-all length of engine ..	12,135	17,680
Height from c.l. of crank shaft to the top of cylinder cover	7,420	6,940
Width of bed plate	3,700	3,800
Space required.		
Length of engine room ..	54-ft.	44.75-ft.
Width of engine room ..	60-ft.	60-ft.
Length of thrust recess ..	9-ft.	12-ft.
Width of thrust recess ..	24-ft.	20-ft.
Length of forward recess ..	—	18-ft.
Width of forward recess ..	—	24-ft.
Total area, sq. ft. . .	3,456	3,357

(IV). RESULTS OF VARIOUS TRIALS

Details of shop trial results are given in Table III.

The lower mean indicated pressure and r.p.m. of the M.A.N. engine combined with smaller diameter and less number of cylinders may cause less structural wear and trouble with consequent durability, but the complexity of valves and valve gears of the double acting engine may cause more trouble in this direction.

In the table quoted, the mechanical efficiency of the B. & W. engine appears lower than that of the M.A.N. engine due to the higher i.h.p. of the former for the same b.h.p., but if the input of the turbo-blower is taken into account, it will be noted that mechanical efficiencies of both the engines are very similar. The super-chargers of the B. & W. engine are directly driven by the main engine, whilst the turbo-blower of the M.A.N. engine is driven independently by an electric motor with supply of power from independent Diesel generators. The motor power being 245 kw. it corresponds approximately to 370 i.h.p. of the main engine, which will make the necessary total i.h.p. of the M.A.N. engine about same as that of the B. & W. engine.

A close study of fuel consumption figures in the shop tests, sea trials and maiden voyages will give very interesting contrasts. In the shop trials, the M.A.N. engine showed far less consumption of fuel oil per b.h.p. per hour than that of the B. & W. engine, but this difference was considerably reduced in sea trials. If the consumption including auxiliaries is considered, the difference is further reduced, and no difference is observable on the basis of i.h.p. In the record of maiden voyages between Yokohama and Los Angeles, the B. & W. engine gave less consumption than the M.A.N.'s on i.h.p. basis. Here again, the question of the independency of turbo-blower and the difference in auxiliary machinery comes into consideration.

It is interesting to note, however, that the usual advantage of less fuel consumption of the four-cycle engine is not very significant in the case of such a high-powered super-charged engine of extreme size, as the consumption can be considered practically the same in both the engines or slightly better in the four-cycle engine.

If cylinder oil consumption is taken into account, the four cycle-engine will naturally show some advantage over the two-cycle engine. Anyhow, altogether the advantage is not so distinguishable as in the usual case, yet the builders of the *Katsuragi Maru*'s engine consider this as the effect of the first stiffness of the engine so that the usual advantage in the fuel consumption can be expected in the long run.

MEAN FUEL OIL CONSUMPTION AT ABOUT FULL POWER

Katsuragi Maru *Kirishima Maru*

Shop Trials

(Main Engine only)

gm./b.h.p./hr.	..	180	156
gm./i.h.p./hr.	..	152	140

Sea Trials

(Main Engine only)

gm./b.h.p./hr.	..	192	166
gm./i.h.p./hr.	..	163.8	151

Including Auxiliaries

gm./b.h.p./hr.	..	195.9	183
gm./i.h.p./hr.	..	166.8	166.5

Maiden Voyages

gm./b.h.p./hr.	..	193	185
gm./i.h.p./hr.	..	158	168

In sea trials, the speed comes into consideration, but it depends upon the power of engine, the design of propeller and ship's form as well as various other factors relating to the resistance and propulsion of ships. The under-water form of the *Kirishima Maru* is a "V" shape, but the *Katsuragi Maru* is of a "U" shape. Further, the details of stern form, rudder and rudder post, the design of propeller, etc., being quite different, some discrepancies in speed trial results are unavoidable. The present article being confined to the comparison of these two different types of engines only, the writer intentionally avoids discussing the question of propulsion, so far as the performance of both the engines has been quite satisfactory for the designed output.

The maximum output of the M.A.N. engine in the sea trials was 7,112 b.h.p. i.e. 7,806 i.h.p., and that of the B. & W. engine was 6,703.5 b.h.p. i.e. 8,066.5 i.h.p., whilst the minimum r.p.m. of the former was 27.5 at 270 i.h.p. and that of the latter was 40.2 at 584.38 i.h.p. The engine could be started up at an air pressure of 13.2 kg. per sq. cm. in the *Kirishima Maru*, while that of the *Katsuragi Maru* was 12.5 kg. per sq. cm.

For the maiden voyage between Yokohama and Los Angeles, the following data are available:—

	<i>Kirishima Maru</i>	<i>Katsuragi Maru</i>
Distance run, naut. miles	4,878	4,878
Condition of sea, average	moderate	rough
Fuel oil consumed, tons		
Total	324	302
per day	25.37	22.93
I.H.P., average	6,460	6,243
B.H.P., average	5,890	5,120
Specific fuel oil consumption.		
gm./i.h.p./hr.	168	158
gm./b.h.p./hr.	185	193
Tons per mile	0.066	0.0619

The writer is informed that the actual performances of both the engines have been quite satisfactory, and the engineers of each ship are in favour of their own engine.

It should be noted that the Admiralty coefficient of the *Kirishima Maru* at a displacement of 12,320 tons on the maiden voyage is computed as 368, whilst that of the *Katsuragi Maru* at 10,750 tons is 355, both being considered as very high figures for this class of vessels.

(V). CONCLUSION

The whole machinery installations, including all necessary engine room auxiliaries, the engines assumed to run continuously at about the normal output and revolutions at sea, the space required, mechanical efficiency, fuel oil consumption, manoeuvring quality, maintenance and performance may be considered very similar in these two engines, whilst the total machinery weight of the *Kirishima Maru* is lighter than that of the *Katsuragi Maru*, the makers' supply price for the machinery is about 5% higher than the latter.

It should not be, however, overlooked that the *Katsuragi Maru*'s engine may be nearly the limit in capacity and size for a single-acting four-cycle Diesel engine, whilst a double-acting two-cycle type is most suitable for a higher power. As to the extreme limit of the former type of engines, a normal output of 7,200 b.h.p. and a maximum output of 8,000 b.h.p. may be obtainable by adding two more cylinders, if desirable, but the latter type with same number and size of cylinders has already developed a maximum output of 9,400 b.h.p. at a higher r.p.m. in case of the M.V. *Fujisan Maru*.* In this connection, the writer considers that both the types can be designed and operated with nearly same efficiency and performance up to a normal output of 6,000-7,000 b.h.p., but for a higher power than this a double-acting engine is not only more advantageous, but will be imperative.

The writer desires to acknowledge his indebtedness to Mr. M. Watase, the owners' Superintendent Naval Architect, for his kind supply of necessary information in preparing this article.

* See *The Far Eastern Review*, March, 1932.

TABLE III.

Results of Shop Trials

The Kirishima Maru

M.A.N. Augsburg Works

22nd January, 1931

4/4 15% over. 3/4 1/2

The Katsuragi Maru

Mitsui-Tama Works

13th March, 1931

4/4 15% over. 3/4 1/2

Place. Date. Load.	4/4	15% over.	3/4	1/2	4/4	15% over.	3/4	1/2
R.P.M.	96	106	88	84	117.23	122.26	108.8	90.55
Mean Pressure, kg./sq.cm. { Top	5.55	5.57	4.68	3.72	8.433	9.2562	7.0763	5.7915
{ Bottom	4.52	4.82	4.00	2.93	—	—	—	—
I.H.P.	6,820	7,580	5,200	3,810	7,082.8	8,109	5,515	3,759
B.H.P.	6,080	6,990	4,540	3,355	6,035.7	6,848	4,557	2,961
Mechanical efficiency, per cent.	89	92.2	87.4	88	85.19	84.5	82.5	78.77
Mean injection pressure, kg./sq.cm.	—	—	—	—	537.7	551.0	474.7	419.75
Cylinder cooling water temperature, C.° { Inlet	23	26	22	26	12.4	13.6	11.7	5.75
{ Outlet	47	48.5	42	45	44.06	43.06	40.75	25.45
Room temperature, C.°	15	14	16.5	16	15.36	14.6	15.7	13.0
Suction air temperature, C.°	—	—	—	—	15.5	16	—	11.25
Exhaust temperature, C.° { Top	282	325	220	150	502.0	576.54	548.63	280.35
{ Bottom	245	290	197	135	—	—	—	—
Super-charge pressure, mercury mm.	—	—	—	—	203.0	217.8	—	138.5
Piston cooling water or oil temperat.		water.				oil		
C.° { Inlet	20	21.5	20.5	23	24.07	23	18.83	15.5
{ Outlet	36	40.5	36	38	44.27	44.35	34.0	26.4
Fuel consumption { kg/hr.	923	1,080	703	524	1,049	1,234	841.04	522.5
{ gm/i.h.p./hr.	138	144	136	137	150.4	152.3	152.5	138.99
{ gm/b.h.p./hr.	155	156.1	155.8	156.5	173.8	180.24	184.75	176.46
Calorific value of fuel (lower)		9,950				10,231		
Specific gravity of fuel at 15°C.		0.899 (Borneo)				0.914		

Engineering Notes

RAILWAYS

LUNGHAI LINE EXTENSION.—Work has been started on the extension of the eastern section of the Lunghai Railway and the construction of a harbor at Laoyiao. The new section, which is 56 li in length, will be built in two sections, namely, from Sinpu to Hukou, 24 li, and from Hukou to Laoyiao, 15 kilometers long. The total cost of the construction of the railway and the harbor is estimated at about \$2,000,000 and the whole work is scheduled to be completed in June, 1933.

LOAN FOR RAILWAY.—The Chinese Ministry of Railways is understood to be negotiating with the Board of Trustees in charge of the British Boxer Indemnity Refund for a loan of \$875,000 for the completion of the Canton-Hankow Railway. For the last link between Shiuchow, in northern Kwangtung, and Chuchow, in central Hunan, a sum of \$175,000 will be required for survey work, and \$700,000 for making the road-bed and laying the tracks.

TRUNK RAILWAYS PLANNED.—In order to develop communication facilities in the southern provinces of Hunan, Kiangsi, Kwangtung and Fukien, in China, the Central Government is considering the construction of three main railways connecting the four provinces. According to tentative plans, Kiangsi will be the center from which the three trunk lines will radiate. It is understood that arrangements will be made for the allocation of a portion of the Boxer Indemnity Refunds for construction expenses. The authorities recently ordered that work on the inter-provincial highways linking Hunan, Kiangsi, Fukien, Hupeh, Anhwei and Honan be expedited, as it was felt that lack of communications has been responsible to a large extent for bandit activities in those provinces.

ELECTRIFICATION IN JAPAN.—The Shima Electric Railway in Miye Prefecture, Japan, is to be extended from Toba to Futami at a cost of Y.600,000. Investigations into railway electrification in Japan show that of the 14,832 km. of State Railway only 2.4 per cent is electrified. There are 7,108 km. of local railways, and of this 53 per cent is electrified. Out of 2,695 km. of tramways, 2,075 km. is electrified, chiefly at 600-v. Most of the State Railway operates at 1,500-v., while just over half of the local railways are run at 1,500-v., the remainder employing 1,200 and 600-v.—*Eastern Engineering and Commerce.*

INDUSTRIAL

PIG-IRON FOR JAPAN.—The Governments of the Union of South Africa and Japan have signed a contract to supply Japan with 30,000 tons of South African scrap iron which will be loaded on Japanese ships in a few days for shipment to Japan. It is understood that the iron will be used for construction of bridges in Japan.

STEEL AGREEMENT.—Nanking reports that the Ministry of Industry has signed the agreement with German interests for the development of a G.\$20,000,000 iron and steel industry in China. It is understood that the Chinese Government is to float bonds to the above amount, the bonds to be held by the German interests as security, and that on the date of signing the German interests will pay from eight hundred thousand to one million gold dollars as deposit money. The Chinese Government will send representatives to Germany to study the iron and steel industry and supervise the purchase of machinery and materials from that country. The management of the iron and steel plants in China will be in Chinese hands, but German experts are to be secured.

ROADS IN SIAM.—Mr. Wirix, a Batavia engineer, was to leave for Siam on May 8 to discuss with the Siamese authorities the possibility of extending the road system in that country and the formation of a British-Dutch concern for the building of roads. If the negotiations are successful Mr. Wirix will discuss the details of the new concern in London.—*Eastern Engineering and Commerce.*

AVIATION

CHINESE AIRWAYS.—In order to avoid competition with the China National Aviation Corporation, the Eurasia Aviation Corporation has reached an understanding with the former regarding the proposed Hankow-Canton Airway. A spokesman of the Eurasia Aviation Corporation states that the proposed route from Canton to Hankow via Hunan will be abandoned in favor of a coastal route from Canton via Swatow, Foochow, Ningpo, and Hangchow to Shanghai. At Shanghai, the Canton air line will connect with the Shanghai-Hankow service now being run by the China National Aviation Corporation.

VLADIVOSTOK AIR LINE.—A giant airplane belonging to the Soviet Department of Civil Aviation will shortly make its maiden trip from Moscow to Berlin and will then be operated on the new line between Moscow and Vladivostok, which is to start before long, considerably shortening the time for communication between Europe and the Far East. The new machine is the largest land plane in Europe. It can seat 40 passengers and carry a useful load of 6,600 kilograms. Its average speed is 120 miles per hour. It is provided with a powerful wireless transmitter. Several other planes of the same type, it is understood, are already under construction to guarantee a regular express service on this new and internationally important route.

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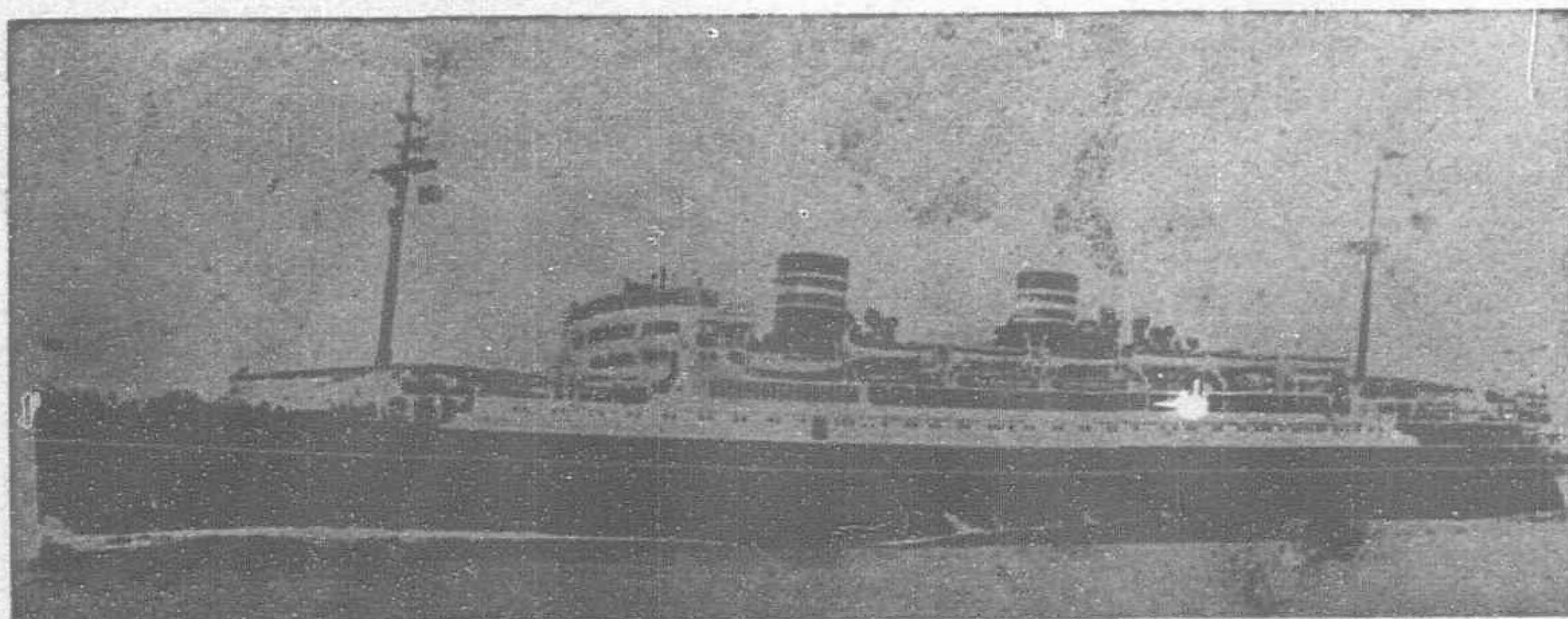
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